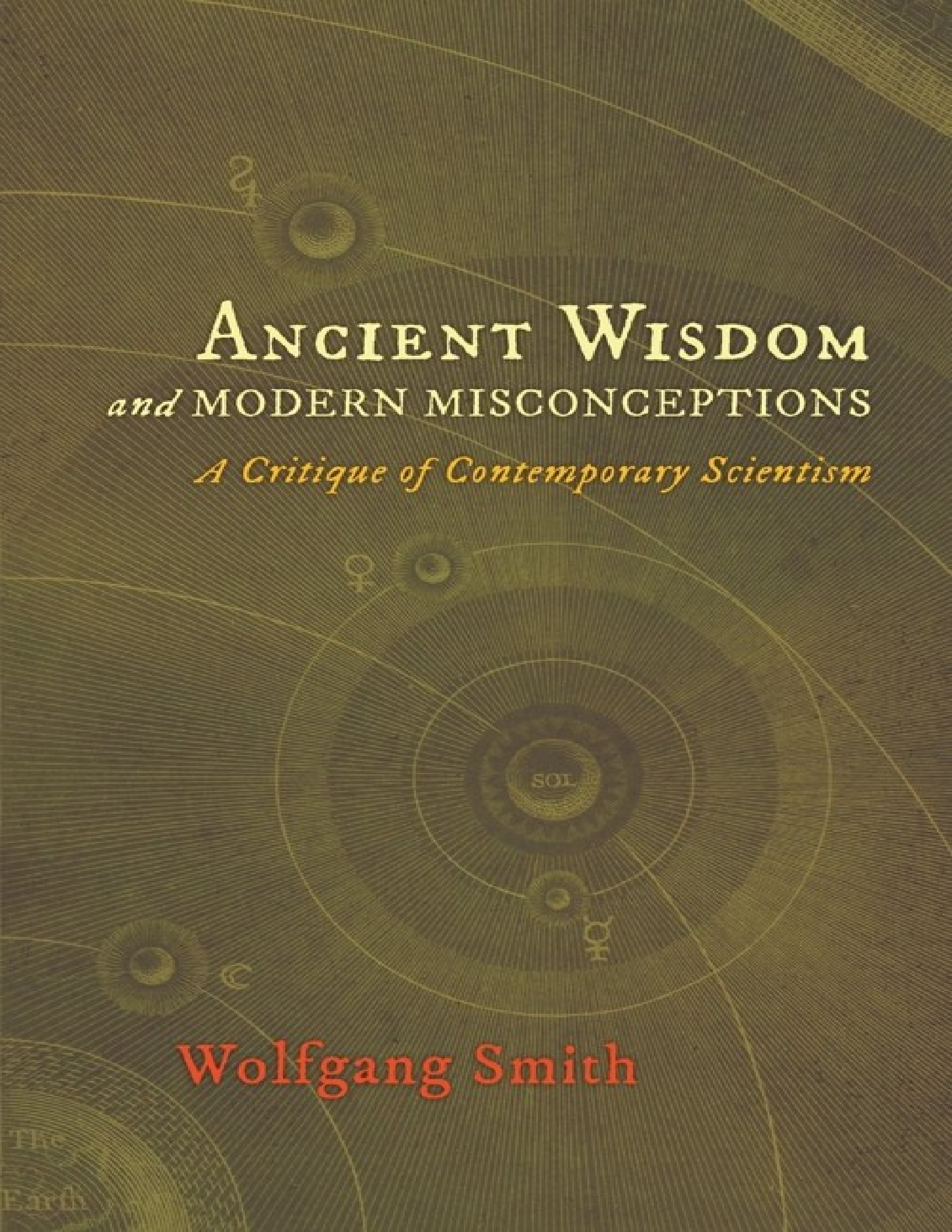
Ancient Wisdom *and* Modern Misconceptions

A Critique of Contemporary Scientism



Wolfgang Smith

ancient wisdom

and Modern misconceptions

A Critique of Contemporary Scientism

BY THE SAME AUTHOR

Cosmos and Transcendence:

Breaking Through the Barrier of Scientistic Belief

Science and Myth:

With a Response to Stephen Hawking's The Grand Design *The Quantum Enigma: Finding the Hidden Key*

Sagesse de la Cosmologie Ancienne

Christian Gnosis:

From Saint Paul to Meister Eckhart

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A Critique of Contemporary Scientism

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Table of Contents

Preface

Forword 1

Introduction 7

1 From Schrödinger's Cat to Thomistic Ontology 14

2 Eddington and the Primacy of the Corporeal 29

3 The Ontology of Bell's Theorem 55

4 Celestial Corporeality 68

5 The Extrapolated Universe 92

6 The Pitfall of Astrophysical Cosmology 118

7 The Status of Geocentrism 141

8 Esoterism and Cosmology: From Ptolemy to Dante and Cusanus 159

9 Intelligent Design and Vertical Causality 180

10 Interpreting Anthropic Coincidence 205

Index of Names 233

In Memoriam

Rev. Fr. Malachi Martin

† July 27, 1999

Preface

This is a revised edition of a book entitled *The Wisdom of Ancient Cosmology* published a decade ago, containing ten of the original twelve chapters. These take the form of essays covering a broad spectrum of topics—from the seeming paradoxes of quantum theory to the staggering claims of contemporary astrophysics—each of which hinges upon an application of "Ancient Wisdom" to the topic at hand: "the rigorous application of traditional keys" to put it in Professor Borella's words.

The customary order of priority is thus reversed: instead of viewing the sapiential traditions from the perspective of contemporary science—which amounts to "explaining away" the most profound and most sacred beliefs of mankind!—the new approach mobilizes the aforesaid Wisdom to attain a *metaphysical* grasp of the stipulated scientific findings. The result is twofold. First, this approach brings to light the crucial distinction between actual scientific discovery and what I have termed "scientistic myth," which turns out to include a major part of what the general public regards as scientific fact. And secondly, having separated the grain from the chaff one arrives at the realization that the actual findings of contemporary science—its "non-mythical" component thus—so far from contradicting the traditional doctrines, can indeed be integrated into that *cosmologia perennis*, which is to say: can in fact be *understood*.

Here, then, we have the answer to Feynman's "No one understands quantum theory" and Whitehead's lament that physics has turned into "a kind of mystic chant over an unintelligible universe."

What renders the universe intelligible proves finally to be none other than that long-neglected and long-despised Ancient Wisdom which in the final count outweighs the contingent productions of mortal endeavor.

Wolfgang Smith, Camarillo, December 15, 2012

Foreword

That there are today, in our civilization, religions with followers still standing by their beliefs is, with respect to the modern world, a kind of anomaly: religious belief definitely belongs to a bygone age. A believer's situation, whatever his religion, is not an easy one then.

But what is true for all sacred forms is especially true for Christianity, because for three centuries it has been directly confronted by the negations of modernity. The day when Hinduism, Buddhism or Islam experience the omnipresence of this modernity, they will undoubtedly in their turn undergo serious crises.

The blows dealt by the modern world against a people's religious soul is in the first place concerned with the plane of immediate and daily existence. No need for ideological struggle here; merely by the strength of its presence and extraordinary material success, this world refutes the world of religion, silences it, and destroys its power. This is because religion speaks of an invisible world, while contemporary civilization renders the sensory world more and more present, the invisible more and more absent.

This is, however, only the most apparent aspect of things. The omnipresence of a world ever more "worldly" is only the effect, in the practical order, of a more decisive cause that is theoretical in nature, namely the revolution of Galilean science, its technical progress being only its consequent confirmation. For the religious soul, the importance of the scientific revolution consists in the fact that it affects this soul's own inwardness. As powerful as it might be, for the human being, society represents only an environment which it can in principle ward off. Whereas the scientific revolution, insofar as it

ascribes the truth to itself, imposes itself irresistibly and from within on the intelligence that it besieges. It is a cultural and therefore a "spiritual" revolution to the extent that it makes an appeal to our mind. But whenever it is a question of a believer's mind, it is the vision of the world and the reality implied by his faith that is

subverted. What remains then is the option either to renounce his faith, or else—an almost desperate solution—to renounce entirely the cosmology that it entails.

On the whole Christian thought has committed itself to this second way: to keep the faith (but a "purified" faith!) and abandon all the cosmological representations by which that faith has been expressed. This is a desperate solution because these cosmological representations are first scriptural *presentations*, the very forms by which God speaks to us about Himself. But if we disregard these forms, what remains of our faith? Scripture informs us that the apostles saw Christ raised from the earth and disappear behind a cloud, while Galilean science objects that space is infinite, that it has neither high nor low, and that this ascension, even supposing it to be possible—which it is not—is meaningless. What remains is then to see in it a symbolic fiction by which the early Christian community attempted to speak its faith in a vanished Jesus Christ: if He is no longer visible, this is because He has "gone back to heaven." Following Rudolf Bultmann the majority of Protestant and Catholic exegetes and theologians have adopted this "solution." Since then an immense process of *demythologization* of Christian scriptures has been in progress. According to Bultmann, what is mythological is a belief in the objective reality of revelation's cosmological presentation: "descent," "resurrection," "ascension," etc. To demythologize is to understand that this cosmological presentation is, in reality, only a *symbolic* language, in other words, a fiction. To pass from myth to symbol, this is the hermeneutic that enables a modern believer, living at the same time in two incompatible universes—that of the Bible and of Galilean science—to avoid cultural schizophrenia.

But at what price? At the price of making unreal all biblical teachings on which faith relies and with which it is bound up. To reject this cosmological presentation, the witnesses of which the apostles, for example, vouch to have been, is this not to reject with the self-same stroke the faith attached to it? What does this parting of faith from its cosmological garment, of kerygma from myth, imply? Basically, would this not separate the Divine Word from its carnal covering and ultimately deny the Incarnation?

How surprising that another way never occurred to Bultmann, a way which, had it been taken into consideration, might have changed many things in the course of the West's religious history. It is this way that the distinguished mathematician Wolfgang Smith proposes to explore, and into which he now offers us insights. In the present crisis, in which Christian thought is split between an impossible fideism and its confinement to moral problems, his book discloses a liberating perspective which, in the name of science itself, restores to faith its entire truth. It would be hard to exaggerate the importance of such a work. On the most essential points, the most burning questions concerned with biblical cosmology, heliocentrism, the nature of space and matter, the concept of a true causality, etc., Wolfgang Smith shows how the conclusions of contemporary science cease to be incompatible with the affirmations of traditional cosmology.

I will only mention the admirable analyses developed in Chapter 6, "The Pitfall of Astrophysical Cosmology." First he sets forth the criticisms certain scientists have directed at the major dogma of the new cosmology, which is "big bang" theory: these criticisms reveal its weakness and even impossibility, and thus disqualify the use theologians have made of that theory. Next he establishes that physics, when applied to celestial bodies, having *de facto* no operational value in that domain, has necessarily an ontological significance, which however is illegitimate. If in fact sidereal bodies, as required by quantum theory, are composed of an almost nonexistent dust of particles, these bodies themselves, as identifiable realities, vanish into space. For a *body* (un *corps*) is also

a body (*un* corps); a being that is not *a* being is no longer a *being*, says Leibniz. Now quantum theory has nothing to say about the existence of this unitary principle needed to account for the reality of a body: it is therefore truly incapable of accounting for the reality of any corporeal being, be it stellar or earthly (which is why some physicists have fallen into an idealism insupportable in other respects). Hence it is absolutely necessary, as Wolfgang Smith reminds us, to have recourse to what traditional philosophy calls a "substantial form," a unitary principle that endows a material body with its own reality. This is no speculative luxury that might be dispensed with, but a rigorously scientific need, since it is the incontestable truth of quantum physics itself that, for want of this substantial form, the reality of bodies is rendered forever *inexplicable* and indeed *impossible*.

We should be thankful to Professor Wolfgang Smith for having reminded us of these primary truths with the authority of a recognized scientist and the full resources of his broad philosophic and religious culture. I also salute his courage, for he has dared to confront, with such constancy, the dominant ideology of modern culture, which is not without risk, to say the least. This ideology has turned science (a certain kind of science!) into the official mythol-ogy of our times. Basically, Wolfgang Smith shows us, with simplic-ity and sometimes with much humor, that Bultmann has chosen the wrong object: it is not religion but the customary interpretation of science that needs to be "demythologized." Now, only the doctrine of the *philosophia perennis* is able to accomplish this, and thereby to disclose the full truth of science itself. And to this end I do not think there is a more useful and efficacious work than the one by Wolfgang Smith that I have the pleasure of prefacing.

Jean Borella

Université de Nancy

Introduction

Given that the tenets of “Ancient Wisdom” will prove pivotal, it behooves us to clarify that concept right from the start. The point needs first of all to be made that the “wisdom” we take to be sovereign is so not simply by virtue of being ancient, but that its primacy derives rather from the fact that it is *traditional*. Yet it happens that the ancient cosmologies did tend to be traditional in varying degrees, and that we shall consequently be concerned with “ancient wisdom” after all.

What renders a doctrine traditional is however the fact that it is *more* than “historical”: that in truth it derives from a *revelation*, of which it constitutes the embodiment. Yet what exactly this means remains perforce incomprehensible so long as we position ourselves within the confines of the prevailing worldview. Suffice it to say that authentically traditional doctrine transgresses the plane of mundane discourse, that the very bounds of space and time which define *our* world are somehow breached. Even when it refers to ordinary things, it does so from an extraordinary perspective: *sub specie aeternitatis* as the Scholastics say. It possesses, moreover, power to inspire: to guide step by step from “*the things that are made*” to the “*invisible things of God*”1 from which in fact they ultimately derive.

Such a teaching serves thus to reconnect its votaries to the spiritual order, and is therefore “religious” in precisely the original sense of *re-ligare*, of “binding back.”

Ancient cosmologies tended to be traditional in varying degrees, we have said; yet it may be more accurate to describe them as traditional doctrines in process of decay. There has been a progressive “falling off ” from the heights of revelation, due evidently to the collective human propensity to be forgetful of things spiritual, uncomprehending of the higher significations concealed, as it were, within 1. Rom. 1:20 teachings of an authentically traditional kind.

Due ultimately to what St. Paul terms a "*darkening of the heart*," the spiritual content of sacred doctrine becomes thus progressively obscured. And this appears to be true above all in the case of traditional cosmology, the spiritual dimensions of which have become almost totally forgotten since the so-called Enlightenment. We need however to bear in mind that this collective process of obscuration did not begin with Galileo, Newton or Descartes, but traces back to the earliest historical periods, and was already well in progress even while the cosmologies in question were still accepted as normative in their external sense.

One knows, however, that "the letter killeth," and that the outer sense of a sacred doctrine cannot outlive for too long the neglect of its inner dimension. It is perhaps surprising, therefore, that "archaic" cosmology did survive in Europe, at least in some of its outer forms, for as long as it has: roughly till the eighteenth century, when it came to be replaced by paradigms of a very different kind.

In light of these observations it is apparent that one cannot expound or delineate traditional cosmology as one would, say, the facts of botany or the history of Greece. Yet there are principles to which all traditional cosmology conforms, and these *can* be stated, and can serve from the start as guideposts along the path of discovery. I propose now to enunciate three such principles, in a kind of ascending order.

The first is quite simple: it affirms that traditional cosmology has to do primarily with the *qualitative* aspects of cosmic reality: the very components, thus, which modern cosmology excludes categorically. As we shall have occasion to see before long, this first recognition, simple though it be, has already enormous implications.

The second principle relates to the metaphysical notion of "verticality" and affirms a hierarchic order, in which the corporeal domain, as commonly understood, constitutes in fact the lowest tier. The transition from traditional to contemporary cosmology entails thus a drastic diminution: an ontological shrinkage of incalculable proportions, which of course pertains, not to the cosmos as such, but

to the horizon of our worldview. As if to compensate for this reduction, contemporary cosmology imputes spatio-temporal magnitudes to the universe at large that stagger the imagination by

their sheer quantitative immensity. The fact remains, however, that the spatio-temporal universe in its entirety constitutes but the outer shell, so to speak, of the integral cosmos as conceived in traditional cosmology.

The third principle presupposes the preceding two, and affirms that man constitutes a microcosm or "universe in miniature," which in a way recapitulates the order of the integral cosmos itself. This recognition, moreover, might well be singled out as the defining characteristic of the traditional worldview, which can in truth be characterized as "anthropomorphic." I say "in truth," because what stands at issue is an ascription of anthropomorphism which is not merely poetical or imaginary, but factual. Tradition maintains that man and cosmos exemplify, so to speak, the same blueprint, the same master plan. This means, first of all, that even as man is trichotomous, consisting of *corpus, anima* and *spiritus*, so too does the cosmos prove to be tripartite, consisting of what Vedic tradition terms the *tribhuvana*, the "three worlds." Generally speaking, all that is essential in the cosmos at large has its counterpart in the *anthropos*.

It may be noted that whereas this conception is common to the major sapiential traditions of the world, it "comes into its own" when interpreted in a Christian key. It is *in Christ*, after all, the Incarnate Word, that we encounter the *anthropos* in his untruncated fullness; and did not St. Paul declare that "*in Him resides all the fullness of the Godhead bodily"* ?2 Yes, "*bodily*" (*somatikos*)! Now this in itself implies that there can be nothing *essential* in the cosmos which is not to be found in the Body of Christ. Man is by no means a stranger in a hostile or indifferent universe, but constitutes *de jure* the very heart and center of the cosmos in its entirety.

Yet it hardly needs saying that this doctrine flies in the face of all contemporary belief: that according to our scientific wisdom, so far from constituting a microcosm, man represents actually a most unlikely anomaly, a precarious molecular formation of astronomical improbability. Except for the laws of physics and chemistry, which are

presumably operative in the cells of his body even as they are in stars and plasmas, he enjoys no kinship whatever with the universe at large, which presents itself as indifferent and ultimately hostile to his human aspirations.

It is no wonder then, in light of what has been noted above, that this presumed scientific wisdom runs aground when it comes to the understanding of man himself: that it has in fact shown itself categorically incapable of accounting for even the most rudimentary act of cognitive sense perception, let alone for the higher modes of sensory and intellective knowing.3 I would like from the start to call attention to the fact that the very possibility of human knowing demands a certain kinship between man and cosmos: the very kinship, in fact, affirmed by the traditional doctrine. As Goethe has beautifully put it: "*Wäre das Auge nicht sonnenhaft*" ("If the eye were not sunlike") we could not behold the Sun. Strange and indeed unbelievable as it may sound: man is able to know the cosmos because, in a marvelous way, the cosmos pre-exists in him.4

Having broached the subject of traditional cosmology, we need of course to ask ourselves whether that cosmology is compatible with the findings of contemporary science: its actual findings, namely, as distinguished from the surrounding nimbus of scientistic beliefs.

Given what we do know today about the universe—its origin, its configuration, and its laws—is it logically defensible to maintain the principles and tenets of that traditional cosmology? To be sure, an overwhelming majority of scientists, philosophers and theologians would instantly answer in the negative. They take it to be self-3. I have discussed this question at length in Chapters 4 & 5 of *Science and Myth* (Tacoma, WA: Angelico Press/Sophia Perennis, 2012).

4. It should be pointed out that an isomorphism of uncanny accuracy between macro- and microcosm has been uncovered some decades ago by a German phenomenologist named Oskar Marcel Hinze, which, perhaps for the first time, supplies hard evidence *of a scientific kind* in support of the traditional contention. On this subject I refer to *Science and Myth*, op. cit *.,* Chapter 6.

evident that modern science has, once and for all, disqualified the "primitive conjectures" of pre-modern man. This judgment accords, moreover, with the evolutionist outlook which perceives everything as arising "from below," and is consequently disposed to give pride of place to the latest turn of collective human belief.

Other groups, comprising a less numerous category, profess high respect for ancient doctrine while they implicitly deny its truth. I am thinking especially of individuals bent upon "psychologizing" every facet of ancient cosmological belief, as if it were a question simply of human fantasies. Suffice it to say that nothing could be more radically opposed to the traditional cosmological teachings, which invariably uphold the basic distinction between the human and the cosmic realms, and insist that cosmology refers indeed to the second of these domains; and one might add that the traditional conception of man as microcosm does not alter this fact, but presupposes it rather. This brings us finally to a third group, which seems to take the ancient doctrines at their word while likewise accepting the outlook of contemporary science, as if there were not the slightest conflict or incompatibility between their respective claims. I have in mind, for example, individuals who cheerfully cast horoscopes and interpret these in more or less traditional terms without realizing that this makes little sense in an Einsteinian universe.

Diverse as these respective mentalities may be, they exhibit a common deficiency. What I find conspicuously lacking is the slightest mark of critical acumen, the least sign that a critique of the prevailing *Weltanschauung* has taken place. Yet it should be abundantly clear that a critique which penetrates to the very foundations of that worldview constitutes today the *sine qua non* for a sane approach to cosmology. Whatever one may think about the past, we live in a present dominated intellectually by the science of our day, and that science needs to be deeply probed and in a way transcended before one can access whatever traditional wisdom the past may hold. As Theodore Roszak has sagaciously observed: "Science is our

religion, because we cannot, most of us, with any living conviction, *see around it*." That is the overriding fact; and it hardly matters whether we extol the wisdom of the past and cast horoscopes: so long as we do not "see around" that science—"break through the barrier of scientistic belief " as the subtitle of my first book has it—we remain intellectually modern, profane, and in truth anti-traditional. And let me add parenthetically that this may be the reason why there are today few if any saints in the cadre of St. Augustine or St. Thomas Aquinas: it seems to be almost a precondition for sanctity, these days, to have escaped a university education.

My point, in any case, is that "the barrier of scientistic belief " can indeed be breached, which is to say that it *is* possible to overcome the preconceptions of modernity and postmodernity alike, and in so doing rejoin the pre-modern human family. This does not of course confer instant illumination; what it does bestow, however, is a faint vision, a fleeting glimpse at least, of high and sacred truths; and this is something priceless and irreplaceable, and greater by far than any imagined wisdom tinged with contemporary preconceptions.

Implicit in all I have said is the contention that the principles and tenets of traditional cosmology have not in fact been disqualified by the actual findings of contemporary science; and to verify this claim one needs to engage in the kind of critique, alluded to above, whereby one arrives at a sharp separation of scientific fact from scientistic fiction. Yet this is only half of what needs to be done: for it is likewise imperative to interpret what science *has* disclosed, to make sense out of its positive findings, failing which one inevitably succumbs once more to some kind of scientistic fantasy. I contend, however, that to arrive at an authentic interpretation of contemporary science one requires the resources of traditional doctrine itself.

In an earlier monograph, entitled *The Quantum Enigma*, I have carried out an approach of this kind for physical science as such, with the result that its generic object—namely the physical universe, properly so called—could be integrated into the traditional ontologies as a sub-corporeal domain. And as might be expected, this throws

light on many questions and explains findings which hitherto had actually seemed paradoxical. As a rule one finds that the

very discoveries of physics which strike us as the most bizarre are those that harbor a major metaphysical truth. Such is the case above all when it comes to the quandaries of quantum theory, the uncanny behavior of quantum particles: what renders the theory paradoxical, it turns out, is a failure on the part of the physicist to distinguish between two disparate ontological planes: the *corporeal*, namely, and the *physical*.5 Nothing that is true, nothing that is valid, is lost by adopting a traditional outlook: from a higher point of vantage one sees, not less, but more. *The teachings of the traditional schools,* I say, *so far from being disqualified by the discoveries of contemporary science, are in fact needed to arrive at a proper understanding of science itself.*

5. See Chapter 3 of *The Quantum Enigma* (Tacoma, WA: Angelico Press/Sophia Perennis, 2012), first published in 1995. Since that time I have explained this fundamental point repeatedly (for instance, in Chapters 2, 3, and 7 of *Science and Myth*, op. cit.). We will be dealing with this question once more in the first Chapter of this book.

1 From Schrödinger's Cat to Thomistic Ontology

Templeton Lecture on Christianity and the Natural Sciences

Gonzaga University, 1998

Let me call your attention, first of all, to an as yet largely unobserved fact: while the scientific worldview continues to consolidate its grip upon society, something quite unexpected has come to pass. The decisive event occurred almost a century ago in fact, back in the early decades of the twentieth century. Since then that so-called scientific worldview—which to this day reigns as the official dogma of science—no longer squares with the known scientific facts. What has happened is that discoveries at the frontiers of science do not accord with the prevailing *Weltanschauung*, with the result that these

findings present the appearance of paradox. It seems that on its most fundamental level, physics itself has disavowed the very worldview proclaimed in its name. This science, therefore, can no longer be interpreted in the customary ontological terms; and thus, as one quantum theorist has put it, physicists have “lost their grip on reality.”1 But obviously this fact has not been publicized, and as the aforesaid physicist observes, constitutes indeed “one of the best-kept secrets of science.” It needs however to be pointed out that, strictly speaking, physics did not “lose” its “grip on reality”: in light of the new findings the fact is rather that modern physics never *had* such a “grip” in the first place.

1. Nick Herbert, *Quantum Reality* (Garden City: Doubleday, 1985), p.15.

This Baconian science, rigorously conceived—that is to say, interpreted without recourse to the customary penumbra of scientistic beliefs—reduces quite simply to a positivistic discipline. And this explains Whitehead’s famous description of that science as “a kind of mystic chant over an unintelligible universe,”2 as well as the admission by one of the leading quantum theorists that “no one understands quantum mechanics.”

To be sure, the incomprehension to which Feynman alludes refers to a *philosophic* plane: one understands the mathematics of quantum mechanics and its connection with empirical procedures, but not the ontology.

Broadly speaking, physicists have reacted to this impasse in three principal ways. The majority, perhaps, have found comfort in a basically pragmatic or “operational” outlook—the fact that “it works”— while some persist, to this day, in the patently futile attempt to fit the positive findings of quantum mechanics into the pre-quantum scientistic ontology. The third category, lastly, which includes some of the most eminent names in physics, convinced that the pre-quantum ontology is now defunct, have cast about for new philosophic postulates, in the hope of arriving at an acceptable conception of physical reality. There appear to be a dozen or so

worldviews presently competing for acceptance in the upper reaches of the scientific community, which to the uninitiated seem to range quite literally from the bizarre to the outright ridiculous.

It is not my objective, in this lecture, to regale you with yet another *ad hoc* philosophy designed to resolve or explain away quantum paradox. I intend rather to do the very opposite: to show, namely, that there is absolutely no need for a new philosophic *Ansatz*, that the problem at hand can in fact be resolved quite naturally on strictly *traditional* philosophic ground. What I propose to show is that the quantum facts, divested of scientistic encrustations, fit perfectly into a very ancient and venerable ontology: the Thomistic, namely, which as you know, traces back to Aristotle.

Rejected by Galileo and Descartes, and subsequently marginalized, this reputedly outmoded medieval speculation, it turns out, resolves the issue instantly. No need for *ad hoc* postulates that stagger our understanding: the keys for which physicists have been groping since the advent of quantum theory, it turns out, have been at hand for well over two thousand years.

2. *Nature and Life* (New York: Greenwood Press, 1968), p.15.

First formulated in 1925, quantum mechanics has shaken the foundations of science. It appears as though physics has, at long last, broken through to its own fundamental level; it has discovered what I shall henceforth term the *physical universe*—a realm which seems to defy some of our most basic conceptions of objective reality. It is a world (if we may call it such) that can be neither perceived nor imagined, but only described in abstract mathematical terms. The most useful and widely accepted of these representation is the one formalized in 1932 by the Hungarian mathematician John von Neumann. In this model the state of a physical system is represented by a vector in a so-called complex Hilbert space. This means, basically, that a state can be multiplied by a complex number, and that two states can be added, and that non-zero linear combinations of states, thus formed, will again be states of the physical system. Now, it is this fundamental fact, known as the

superposition principle, that gives rise to quantum strangeness. Consider, for instance, a physical system consisting of a single particle, and then consider two states, in which the particle is situated, respectively, in two dis-joint regions A and B, which can be as widely separated as we like. A linear combination of these two states with non-zero coefficients will then determine a third state, in which apparently the particle is situated, neither in A nor in B, but somehow in both regions at once. Now, one may say: “State vectors actually describe, not the physical system as such, but our knowledge concerning the physical system. The third state vector, thus, simply signifies that, so far as we know, the particle can be in A or in B, with a certain probability attached to each of the two possible events.” A grave difficulty, however, remains; for the state of the physical system corresponding to the third state vector can in fact be produced experimentally, and when one does produce that state one obtains interference effects which could not be there if the particle were situated in A or in B. In some unimaginable way the particle seems thus to be actually in A and B at once.

What happens, then, if one measures or observes the position of the particle in the third state? It turns out that the act of measurement instantly throws the system into a new state. The *detected* particle, of course, is situated either in A or in B, which is to say that only unobserved particles can bilocate. All this, to be sure, is very strange; but let me emphasize that from a mathematical point of view all is well, and that in fact the theory functions magnificently.

As I have said before, what puzzles physicists is not the mathematics, but the ontology.

Thus far I may have conveyed the impression that superposition states are rare and somehow exceptional. What is indeed exceptional, however, are states in which a given observable *does* have a precise value (the so-called eigenstates); yet even in that case it happens that the system remains necessarily in a superposition state with respect to other observables. The quantum system, thus, is always in a state of superposition; or more precisely,

it is at one and the same time in many different states of superposition, depending upon the observable one has in view. On the quantum level superposition is not the exception, but indeed the fundamental fact.

At this point one might say: “There is no reason to be unduly perplexed; superposition applies, after all, to microsystems too minute to be perceptible. Why worry then if ‘weird things’ happen on the level of fundamental particles and atoms? Why expect that one can picture things or happenings which are by nature imperceptible?” Most physicists, I believe, would be happy to adopt this position, if it were not for the fact that superposition tends to bleed into the macroscopic domain. It is this quantum-mechanical fact that has been dramatized by Erwin Schrödinger in the celebrated thought-experiment in which the disintegration of a radioactive nucleus triggers the execution of the now famous “Schrödinger cat.”

According to quantum theory, the unobserved nucleus is in a superposition state, which is to say that its state vector is a linear combination of state vectors corresponding to the disintegrated and undisintegrated states. This superposition, moreover, is transmitted, by virtue of the experimental setup, to the cat, which is consequently in a corresponding superposition state. In plain terms, the cat is both dead and alive! The hapless creature remains moreover in this curious condition until an act of observation “collapses its state vector” as the expression goes, and thereby reduces that state vector to one or the other classical eigenstate. The cat is then either dead or alive, period.

The mystery here, of course, has nothing to do with the nature of cats, but pertains rather to the role of measurement in the economy of quantum mechanics. Now, measurement is a procedure in which a given physical system is made to interact with an instrument so that the resultant state of that instrument indicates the value of some specific observable associated with that system. For example, a

particle is made to collide with a detector (a photographic plate, perhaps) which registers its position at the moment of impact.

Prior to this interaction, the particle will in general be in a superposition state involving multiple positions; we must think of it as spread out over some region of space. Its evolution or movement prior to impact, moreover, is governed by the so-called Schrödinger equation, which is linear, and hence preserves superposition, and is moreover strictly deterministic, which means that given an initial state, the future states are then uniquely determined. At the moment of impact, however, this deterministic Schrödinger evolution is superseded by another quantum-mechanical law, a so-called projection, which singles out one of the positions represented in the given superposition state—apparently for no good reason!—and instantly assigns the particle to the chosen location. Now, this simple scenario exemplifies what happens generally in the act of measurement: a physical system interacts with an instrument or measuring apparatus, and this interaction causes the Schrödinger evolution of the system to be superseded by an apparently random projection. It is as though the trajectory of a particle, let us say, were suddenly altered without any assignable cause. Why does this happen? Inasmuch as the instrument is itself a physical system, one would expect that the combined system, obtained by including the instrument, should itself evolve in accordance with the corresponding Schrödinger equation; but in fact it does not! What is it, then, that distinguishes the kind of interaction we term measurement from other interactions between physical systems, in which Schrödinger evolution is *not* superseded?

Quantum theory holds many puzzles of this kind; the “scandal” of superposition assumes many forms. I would like to mention one more of these enigmas, which strikes me as particularly significant.

One might think of it as a simplified version of the Schrödinger cat paradox. In the words of Roger Penrose, the problem is this: “The rules are that *any* two states whatever, irrespective of how different from one another they may be, can coexist in any complex linear

superposition. Indeed, any physical object, itself made out of individual particles, ought to be able to exist in such superpositions of spatially widely separated states, and so be ‘in two places at once’! . . . Why, then, do we not experience macroscopic bodies, say cricket balls, or even people, having two completely different locations at once? This is a profound question, and present-day quantum theory does not really provide us with a satisfying answer.”3 It happens that these matters have been debated for a very long time, and various interpretations of the mathematical formalism have been proposed in an effort to make philosophic sense out of the theory. However, as Penrose observes: “These puzzles, in one guise or another, persist in *any* interpretation of quantum mechanics as the theory exists today.”4 After more than half a century of debate it appears that no clear resolution of the problem is yet in sight. One thing, however, one crucial point, has been consistently overlooked; and that is what I must now explain.

3. *The Emperor’s New Mind* (Oxford University Press, 1989), p.256.

4. Ibid., p.296.

As one knows very well, it was the seventeenth-century philosopher René Descartes who laid the philosophic foundations of modern physics. Descartes conceived of the external or objective world as made up of so-called *res extensae*, extended things bereft of sensible qualities, which can be fully described in purely quantitative or mathematical terms. Besides *res extensae* he posits also *res cogitantes* or thinking entities, and it is to these that he consigned the sensible qualities, along with whatever else in the universe might be recalcitrant to mathematical definition. One generally regards this Cartesian partition of reality into *res extensae* and *res cogitantes* as simply an affirmation of the mind-body dichotomy, forgetting that it is much more than that; for not only has Descartes distinguished sharply between mind and body, but he has at the same time imposed an exceedingly strange and indeed problematic conception of corporeal nature, a conception, in fact, that renders the external world unperceived and unperceivable. According to René Descartes,

the red apple we perceive exists—not in the external world, as mankind had believed all along—but in the mind, the *res cogitans*; in short, it is a mental phantasm which we have naïvely mistaken for an external entity. Descartes admits, of course, that in normal sense perception the phantasm is causally related to an external object, a *res extensa*; but the fact remains that it is not the *res extensa*, but the phantasm that is actually perceived. What was previously conceived as a single object—and what in daily life is invariably regarded as such—has now been split in two; as Whitehead has put it: “Thus there would be two natures, one is the conjecture and the other is the dream.”5 Now, this splitting of the object into a “conjecture” and a “dream” is what Whitehead terms “bifurcation”; and this, it turns out, constitutes the decisive philosophic postulate which underlies and determines our customary interpretation of physics. Beginning with his Tarner Lectures (delivered at Cambridge University in 1919), Whitehead has insistently pointed out and commented upon this fact. “The result,” he declared, “is a complete muddle in scientific thought, in philosophic cosmology, and in epistemology. But any doctrine which does not implicitly presuppose this point of view is assailed as unintelligible.”6 I am here to tell you that today, after seventy years of quantum debate, the situation remains fundamentally unchanged. Just about every other article of philosophic belief, it would seem, has been put on the table and subjected to scrutiny, while bifurcation continues to be implicitly presupposed as if it were a sacrosanct dogma revealed from on high. And so “the muddle in scientific thought” continues, and has only been exacerbated by the demands of quantum theory.

5. *The Concept of Nature* (Cambridge University Press, 1964), p. 30.

6. *Nature and Life*, op. cit., p.6.

That’s the bad news; the good news is that the situation can be remedied. In a recent monograph I have shown that physics can indeed be interpreted on a non-bifurcationist basis, with the result that quantum paradox disappears of its own accord.7 No need for such far-flung notions as the “many worlds” hypothesis or any other

ad hoc stipulation; to resolve the semblance of paradox one needs but to relinquish a certain philosophic postulate foisted upon us by Galileo and Descartes. Quantum paradox, it appears, is but Nature's way of repudiating a spurious philosophy.

We need thus to take a second look at quantum mechanics, but this time from a non-bifurcationist point of view. Now, to deny bifurcation is to affirm the objective reality of the perceived entity: the red apple, thus, is once again recognized as an actual external object.

That perceptible entity, moreover, is to be distinguished from what may be called the "molecular apple," a thing, clearly, which can *not* be perceived, but is to be known only through the methods of physical science. One is led thus to distinguish between two kinds of external objects: *corporeal* objects, which can be perceived, and *physical* objects, which can only be observed indirectly through the *modus operandi* of the experimental physicist. The two ontological domains are of course closely related, failing which there could be no science of the physical at all. The basic fact is this: Every corporeal object X is associated with a physical object SX from which it derives all of its *quantitative* attributes. The red apple, for example, derives its weight from the molecular. The crucial point, however, is 7. *The Quantum Enigma,* op. cit. A useful summary with helpful commentary has been given by William A. Wallace in "Thomism and the Quantum Enigma," that the two are not the same thing; X and SX belong in fact to different ontological planes: to different worlds, one could almost say.

The Thomist, vol. 61 (1997), pp. 455–467.

The bifurcationist, obviously, does not recognize this distinction, inasmuch as he denies the existence of the corporeal object X; but in so doing, he implicitly identifies X with SX. The bifurcationist interpretation of physics entails thus a reduction of the corporeal to the physical: and therein—in that reductionism, I say—lies the fundamental fallacy of the prevailing *Weltanschauung*.

The amazing fact, however, is this: Whereas classical physics tolerates that ontological error, quantum mechanics does not. It happens that the new physics itself distinguishes between X and SX; it insists in fact upon that distinction—which is precisely what perplexes the physicist. By its very structure—that is to say, in its categorical distinction between the physical system and its observables—quantum mechanics affirms in its own way the ontological distinction between the physical and the corporeal planes. To be precise, while the system itself belongs to the physical domain, the act of measurement terminates evidently on the corporeal: in the perceptible state, namely, of a corporeal instrument. It is true that the corporeal instrument I is associated with a physical system SI: the point however, once again, is that the two are by no means the same. What distinguishes measurement, thus, from a physical process is the fact that it realizes an ontological transition from the physical to the corporeal domain. No wonder quantum theory is entails two very different "laws": for it has become apparent that Schrödinger evolution operates *within* the physical domain, whereas projection (operative in the act of measurement) refers to a transit from the physical into the corporeal. In the language of metaphysics one can say that the former applies to a "horizontal" whereas the latter refers to a "vertical" process. So too one sees that the discontinuity of state vector collapse mirrors an *ontological* discontinuity, which is of course the reason why that phenomenon is inherently incomprehensible from a reductionist point of view.

Metaphysically speaking, state vector collapse is inexplicable on a physical basis because it results from the act of a *corporeal* entity.

These considerations strongly suggest that the superposition principle needs to be amended for *subcorporeal* systems, i.e., for the SX of a corporeal object X, since it is altogether reasonable to suppose that the state vector of SX can admit only superpositions consistent with the perceivable properties of X. And that is doubtless the reason why cricket balls don't bilocate, and why cats cannot be both dead and alive. Penrose is absolutely right: if cricket balls and cats *were* "made of individual particles," they would indeed be able

to exist in unrestricted states of superposition; the point, however, is that they are not in fact thus made. From a non-bifurcationist point of view, corporeal objects, as we have seen, are not simply aggregates of particles, but something more. We need therefore to inquire what it is that differentiates X from SX; and for this we shall turn to the Thomistic ontology.

We must begin where St. Thomas himself began: namely, with the fundamental conceptions of Aristotle. The first step, if you will, in the analysis of *being*, is to distinguish between *substances* and *attributes*: between things that exist in themselves and things that exist in another. Having thus distinguished between what is primary and what is secondary, one proceeds to the analysis of the primary thing. The problem is to break substance into its components: to split the atom of substance, as one might say; and for this one evidently requires the conception of things more primitive than substances, things “out of which” substances are made. Aristotle solved this problem with one of the great master-strokes in the history of philosophy: the distinction between *potency* and *act*. The customary definition of these terms is simple and quite unimpressive at first glance: that which is capable of being a certain thing, but is not that thing, is that thing in potency, whereas that which already is, is so in act. A seed is a tree in potency, and a tree is a tree in act. Aristotle goes on to define *matter*, or prime matter, to be exact, as that which is in potency to substance, to substantial being.

Prime matter as such has consequently no being; but it has nonetheless a capacity or an aptitude for being, one can say. Now, what actualizes this capacity is indeed an act, and that act is called a *form*, or more precisely, a *substantial form*. Substance has thus been split into two components: into *matter* and *form*. It is the form, moreover, which contributes to the substance its essential content, its quiddity or “whatness,” what the Germans so expressively call its *Sosein*. And yet that form is not itself the substance, is not itself the existent thing; for the form without matter does not exist.

It is at this point of the analysis that the genius of St. Thomas Aquinas becomes manifest. And here we come to a second master-stroke in the history of philosophy: he recognized that substantial form is itself in potency to something else: to an act, namely, which is not a form; and that is the *act-of-being* itself. To put it in his own words: “The act-of-being is the most intimate element in anything, and the most profound element in all things, because it is like a form in regard to all that is in the thing.”8 Now, that innermost element constitutes the “point of contact,” as it were, between created being and its uncreated Source, which is God. The act-of-being belongs thus in the first place to God, who creates and sustains the universe; but yet it also belongs to created substance as its innermost reality. We may think of it as radiating outwards, through the substantial form, to the very accidents by which the being communicates itself to us.

8. *Summa Theologiae* I, Quest. 8, Art. 1.

Every being, moreover, is endowed with a certain efficacy, a certain power to act outside itself, which likewise derives from its act-of-being, and thus from God. And yet that efficacy, that power, is distinctly its own. As Etienne Gilson has beautifully explained: “The universe, as represented by St. Thomas, is not a mass of inert bodies passively moved by a force which passes through them, but a collection of active beings each enjoying an efficacy delegated to it by God along with actual being. At the first beginning of a world like this, we have to place not so much a force being exercised as an infinite goodness communicated. Love is the unfathomable source of all causality.”9

9. *The Christian Philosophy of St. Thomas Aquinas* (Notre Dame, IN: University of Notre Dame Press, 1994), p.183.

We are beginning, perhaps, to catch a glimpse of the Thomistic ontology; but let us continue. Not only is God’s love the unfathomable source of all causality, but all causation, as we know it, *imitates* that love. To quote Gilson once more:

Beneath each natural form lies hidden a desire to imitate by means of action the creative fecundity and pure actuality of God. This desire is quite unconscious in the domain of bodies; but it is that same straining towards God which, with intelligence and will, will blossom forth into human morality. Thus, if a physics of bodies exists, it is because there exists first a mystical theology of the divine life. The natural laws of motion, and its communication from being to being, imitate the primitive creative effusion from God. The efficacy of second causes is but the counterpart of His fecundity."10

10. Ibid., p.184.

This same Thomistic vision of Nature has been expressed by Meister Eckhart in a passage of rare beauty which I would like also to share with you, in which he writes:

You must understand that all creatures are by nature endeavoring to be like God. The heavens would not revolve unless they followed on the track of God or of his likeness. If God were not in all things, Nature would stop dead, not working and not wanting; for whether thou like it or no, whether thou know it or not, Nature fundamentally is seeking, though obscurely, and tending towards God. No man in his extremity of thirst but would refuse the proffered draught in which there was no God. Nature's quarry is not meat or drink . . . nor any things at all wherein is naught of God, but covertly she seeks and ever more hotly she pursues the trail of God therein.11

11. *Meister Eckhart,* C. de B. Evans, trans. (London: Watkins, 1925), vol. i, p.115.

Here we have it: a vision of Nature which penetrates to the very heart of things, to that "most profound element" in fact, which St. Thomas has identified as its act-of-being. And to be sure, this is no longer an Aristotelian, but an authentically Christian *Weltanschauung*. I propose to show next how the findings of quantum theory fit into that Christian worldview.

It needs to be pointed out, first of all, that the Thomistic philosophy, no less than the Aristotelian, is unequivocally nonbifurcationist. There is not the slightest trace of “Cartesian doubt” to be found in either philosophy. What we know by way of sense perception are external objects, period; and these are the objects that enter into the Thomistic ontology. It follows that the findings of physics (our physics, that is) can be assimilated into the Thomistic worldview only on condition that they be first interpreted in nonbifurcationist terms.

The fundamental problem, clearly, is to situate the physical domain ontologically in relation to the corporeal. Now, we know that transitions from the physical to the corporeal are effected by acts of measurement in which a certain possibility inherent in a given physical system is actualized; and this constitutes, Thomistically speaking, a passage from potency to act. A physical system as such may consequently be conceived as a potency in relation to the corporeal domain. And I might add that this point has in fact been made forcefully by Heisenberg with reference to fundamental particles: “a strange kind of physical entity just in the middle between possibility and reality”12 he calls these entities, and goes on to observe that in certain respects they are reminiscent of what he terms “Aristotelian *potentiae*.” However, when it comes to the macroscopic domain, that is to say, to aggregates of fundamental particles that constitute the SX of a corporeal object X, Heisenberg identifies X and SX without the least scruple—as if the mere aggregation of atoms could effect a transition from potency to act! Nonbifurcation, on the other hand implies, as we have seen, an ontological distinction between X and SX, which is to say that SX, no less than the quantum particles out of which it is composed, constitutes itself “a strange kind of physical entity just in the middle between possibility and reality.” To be precise, fundamental particles and their aggregates—be they ever so macroscopic!—occupy a position, ontologically speaking, between primary matter and the corporeal domain. It appears that contemporary physics has discovered an intermediary level of existence unknown and undreamt of in pre-modern times: and this is what I term the “physical universe.”

12. *Physics and Philosophy* (New York: Harper & Row, 1962), p. 41.

What is it, then, that differentiates the two ontological planes?

From an Aristotelian or Thomistic point of view the answer is clear: what distinguishes a corporeal object X from SX is precisely its substantial form. It is this form that bestows upon X its corporeal nature and specific essence, its "whatness" or *Sosein*, as we have said. And it is important to emphasize that this substantial form is perforce something other than a mathematical structure; for indeed, if it were, X and SX would in fact coincide. One might say that SX itself comprises everything in X that is "quantitative" or reducible to mathematical structure in the widest sense. Substantial forms, therefore, are not amenable to a quantitative or rigorously mathematical science. It is to be noted, moreover, that this fact was clearly recognized by Descartes himself: "We can easily conceive," he writes, "how the motion of one body can be caused by that of another, and diversified by the size, figure and situation of its parts, but we are wholly unable to conceive how these same things can produce something else of a nature entirely different from themselves, as for example, those substantial forms and real qualities which many philosophers suppose to be in bodies."13 It needs however to be noted that this is precisely the reason why the protagonists of universal mechanism, headed by Galileo and Descartes, rejected substantial forms and banished sensible qualities from the external world: substantial forms as well as sensible qualities had to be excluded because neither could be reduced to mechanical terms.

13. See E.A. Burtt, *The Metaphysical Foundations of Modern Physical Science* (New York: Humanities Press, 1951), p.112.

In so doing, however, Galileo and Descartes have cast out the very essence of corporeal being; one is left with a de-essentialized universe, a world emptied of reality.

We need today to free ourselves from the iron grip of this spurious and dehumanizing dogma. We need to rediscover the fullness of the

corporeal world, replete with substantial forms and real qualities, which moreover enshrines at its very core the mystery of what St. Thomas calls “the most profound element in all things.” We have need of this discovery in every domain of life, including the scientific: even when it comes to the philosophic or “more-than-operational” understanding of quantum theory, as we have seen. But we have need of a sound ontology above all in the spiritual domain: authentic Christianity, in particular, demands a sacramental capacity on the part of matter which is categorically inconceivable in Cartesian terms. It hardly needs pointing out that in a universe comprised of quantum particles—in which not even a red apple can exist!—the Christic mysteries have absolutely no place. Now, I surmise that of all the true philosophies—and I believe there may be more than one—the Thomistic is for us the safest and most efficacious means by which to effect the liberating intellectual rectification. Whosoever has sensed that “love is the unfathomable source of all causation” has already broken the chains; and whoever has grasped, even dimly, what St. Thomas terms the “act-of-being” is well on his way.

2 Eddington and the Primacy of the Corporeal

In his Tarner Lectures of 1938, published as *The Philosophy of Physical Science*, Sir Arthur Eddington has enunciated reflections on the nature of physics which to this day challenge our understanding of the physical universe. As is well known, Eddington championed a subjectivist interpretation of physical science: “selective subjectivism,” he called it. Comparing the physicist to a fisherman catching fish with a net, he contends that the known laws of physics can be deduced simply from the structure of the “net” itself. Even the basic numerical “constants of nature,” as they are called, can supposedly be elicited by epistemological considerations alone. In a technical treatise, entitled *Relativity Theory of Protons and Electrons* (published in 1936), he claims in fact to have accomplished these very feats of mathematical derivation. One is bound to wonder, of course, whether there might not be some gap or hidden flaw in these

putative deductions. Suffice it to say that the significance and lasting relevance of Eddington's philosophy does not hinge on this question. It is no doubt true that his outlook, though widely respected, has rarely met with full belief: how could it be otherwise when someone, no matter how illustrious, purports to deduce—without recourse to a single experiment—that there are exactly 136x2256 electrons in the universe!1 I would however add that the more carefully one reads *The Philosophy of Physical Science*, the less fantastic such claims will seem.

1. Positrons are counted negatively, so that the total remains unchanged by electron-positron interactions.

Meanwhile it happens that the subjectivist interpretation of physics has, in any case, been gaining ground as a major trend, driven by the evolution of physics itself. In light of quantum theory one has come to understand that the act of measurement affects the system under observation in ways that can be neither predicted nor controlled. The presumed objectivity of physics has thus been compromised, and one hardly knows where to draw the line: how much, in other words, of what the physicist "discovers" may actually be the result of his own intervention. The very conception of physics has changed; as Heisenberg has put it: "Science [meaning physics] no longer stands before Nature as an onlooker, but recognizes itself as part of this interplay between Man and Nature."2 This "interplay," moreover, is evidently effected by the act of measurement: it is here that the physicist acts upon Nature, and it is here too that Nature responds. Could it be, then, that Eddington was right after all: that the "net" of mensuration does determine the laws—and perhaps even the universal constants—of physics? It appears, on the strength of recent findings by an American physicist named Roy Frieden, that this is indeed the case. In a monograph entitled *Physics from Fisher Information*, published by Cambridge University Press in 1998, Frieden has essentially done what Eddington declared to be doable: from an analysis of the measuring process, Frieden has deduced the corresponding laws of physics. The analysis is information-theoretic, and Frieden employs a little-known

information functional, discovered in 1925 by a statistician named Ronald Fisher.

2. *Das Naturbild der heutigen Physik* (Hamburg, Rowohlt, 1955), p.21.

What takes place, according to Frieden, in the input space of a measuring instrument, is a transfer of Fisher information from an information content J, “bound” to the phenomenon, to the acquired information content I from which the data are sampled. Frieden’s great discovery is that the information difference I minus J (the so-called *physical* information K) satisfies a variational principle: roughly speaking, Nature contrives to minimize K.3

3. Frieden show that this “interplay” between Nature and the instrument of mensuration can be conceived as a so-called “zero-sum” game between the physicist seeking information and an opponent reluctant to part with it. It happens that the opponent (representing Nature) generally wins.

The decisive fact is that the physical information K turns out to be a universal Lagrangian from which the laws of physics can be derived.

The resultant approach—dubbed “the method of extreme physical information” or EPI for short 4—has been successfully applied to the major domains, and no end of its scope is yet in sight. As a matter of fact, physicists seem for the most part to be interested in EPI, not so much on account of its enormous philosophical implications, but mainly because it is proving to be a powerful research tool. For instance, EPI is presently being applied to problems in quantum gravity and turbulence which have proved recalcitrant to other means of approach.

4. I should note that EPI imposes one further condition: in addition to the stated variational principle it imposes an algebraic condition on I and J. Thus amended, EPI constitutes a “top law” from which most if not all the laws of physics can be derived. The EPI principle itself, however, though arrived at by way of heuristic considerations, is not

deduced *à la* Eddington through epistemological analysis. Frieden's claims are thus a bit more modest.

What presently concerns us is the fact that Frieden's spectacular results go a long way in support of Eddington's philosophy. Yes, it does appear to be the interaction between the measuring instrument and the measured system— the "net" and the "fish"—that accounts for the laws of physics, as the British savant had long ago foretold.5

5. This is not to say that there must be some mathematical kinship between Frieden's EPI approach and Eddington's group-theoretic derivations. The only thing these exceedingly different derivations have in common—on the surface, at least—is the amazing claim to deduce the fundamental laws of physics from an analysis of the measuring process.

I propose now to present a summary of Eddington's philosophy, followed by critical reflections consonant with the Aristotelian and Thomistic traditions. I shall argue, in particular, that the very logic of Eddington's approach *demands* the distinction between what I have termed the *physical* and the *corporeal* domains, and moreover entails the ontological primacy of the corporeal.

2 Ancient Wisdom and Modern Misconceptions

Eddington commences his inquiry into the nature of physics with an appropriate definition of the physical universe: "Physical knowledge (as accepted and formulated today)," he writes, "has the form of a description of a world. We *define* the physical universe to be the world so described." (3)6 The physical universe, according to this definition, is not simply the universe as such, but the universe "so described": it is the world as seen through the lenses of the physicist. And these "lenses," Eddington contends, introduce subjective elements into the physical universe, i.e., the universe "so described."

6. The page numbers in parentheses refer to *The Philosophy of Physical Science* (Cambridge University Press, 1939).

Certainly the descriptions at which the physicist arrives are not wholly subjective; yet Eddington insists that the *laws* of physics, as distinguished from what he terms special facts, *are* wholly subjective. And that is precisely the reason why these laws can indeed be known with mathematical precision: the vaunted precision of physics, Eddington declares, derives in fact from its subjectivity; as Whitehead once put it: “Exactness is a fake.” The so-called special facts, on the other hand, are objective to some extent, “depending partly on our procedure in obtaining observational knowledge, and partly on what there is to observe.” (66) Take for instance the fact that the Moon is so and so many miles distant from the Earth: although this finding presupposes evidently an observational procedure for measuring distance, it is not determined by that procedure alone: not even Eddington would go that far! The aforesaid assertion concerning the Moon has thus an objective content; but for that very reason the distance in question turns out not to be knowable with absolute precision. We will return to that side of the story later, in connection with quantum theory and the role of probabilities.

Having distinguished between laws and special facts, one finds the latter to be the more problematic, on account of their “partly objective, partly subjective” character. What about the structure of the atom, as currently conceived? “When the late Lord Rutherford showed us the atomic nucleus,” asks Eddington, “did he *find* it or did he *make* it?” (109) The question proves not to be entirely well posed. When a hunter searches the forest and encounters a deer, he has clearly *found* or *discovered* the object of his quest. But what about the experimentalist who passes white light through a prism and observes the color green; has he “found” the color green (as the hunter has found the deer), or has he indeed “made” that color?

Does the color green pre-exist in the white light, or has it been added as an effect of the experimental intervention? One could answer

either way; and therefore, strictly speaking, the question admits of no definite answer, no simple “yes or no.” The example of light diffraction, moreover, carries a very broad significance; for as Eddington points out: “The question does not merely concern light waves, since in modern physics *form*, particularly wave form, is at the root of everything.” (111) Getting back to the atomic nucleus, the case turns out to be indeed analogous to that of the color green: “It is equally unrigorous,” Eddington contends, “to speak of the nucleus as having been ‘discovered’. The discovery does not go beyond the waves which represent the knowledge we have of the nucleus.” (111)

Continuing his inquiry into the nature of the physicist’s “net,”

Eddington distinguishes between the application of scientific instruments and the conceptual frame of reference in terms of which empirical data are interpreted. “Whatever we have to apprehend,” he notes, “must be apprehended in a way for which our intellectual equipment has made provisions.” (115) And in a passage which reads like a page out of Immanuel Kant, he goes on to explain:

The epistemological method of investigation leads us to study the nature of the frame of thought, and so be forewarned of its impress on the knowledge that will be forced into it. We may foresee *a priori* certain characteristic which any knowledge contained in the frame will have, simply because it is contained in the frame.

These characteristic will be discovered *a posteriori* by physicists who employ that frame of thought, when they come to examine the knowledge they have forced into it. Procrustes again!7 (116) It appears that everything hinges upon that hidden “frame of thought”; what then can Eddington tell us concerning this all-important but generally forgotten factor? “For a scientific outlook,” he begins, “I think the most fundamental of all forms of thought is the *concept of analysis*. This means the concept of a whole as divisible into parts, such that the co-existence of the parts constitutes the existence of the whole.” (118) A major comment is called for at this point. In light of the Aristotelian definition of *quantity* as “that which admits mutually external parts,” one sees that acceptance of the so-called

concept of analysis has restricted the purview of physics *in principle* to the quantitative domain. And this fact in itself explains why "the concept of substance has disappeared from fundamental physics" (110): it has disappeared because the concept of substance is not reducible to quantitative terms. As the Scholastics have taught, substance derives from essence or substantial form, whereas "*Numerus stat ex parte materiae*." It happens that "the concept of analysis" filters out, not only qualities, but substantial forms as well. Thus, when Eddington asserts that "what we ultimately come down to is *form*," we must understand that it is a very special kind of "form" he is alluding to: *mathematical form*, one can say, the equivalent of mathematical structure.

But let us return to Eddington's train of thought: he now goes on to point out that the concept of analysis is further narrowed by what he terms "the atomic concept," or the concept of identical structural units. "The new conception," he explains, "is not merely that the whole is analyzable into a complete set of parts, but that it is analyzable into parts which resemble one another. . . . I will go farther, and say that the aim of the analysis employed in physics is to resolve the universe into structural units which are *precisely* like one another." (122) 7. A few pages earlier Eddington had this to say regarding the Procrustes fable:

"Procrustes, you will recall, stretched or chopped down his guests to fit the bed he had constructed. But perhaps you have not heard the rest of the story. He measured them up before they left the next morning, and wrote a learned paper "On the Uniformity of Stature of Travelers" for the Anthropological Society of Attica. (110) 34

This too calls for a word of comment. The concept of analysis, in its weaker version, eliminates substantial form from the whole, but not necessarily from the parts. However, the additional requirement that the parts shall be "precisely alike" does in effect de-substantial-ize the parts as well. It entails that mathematical structure is all that remains—a goal, I would add, which cannot be fully realized, for the simple reason that in the absence of all substance *nothing whatever*

remains. Yet even so, the goal proves to be useful as a heuristic principle. Situated, as it is, in the physicist's fundamental frame of thought, the idea has consequences. Meanwhile, as everyone knows, "fundamental particles" have indeed been found (or "made"!), and while these are not all alike, they do break into classes within which the members *are* "precisely like one another." Why, then, has this occurred? As Eddington goes on the explain:

Granting that the elementary units found in our analysis of the universe are precisely alike intrinsically, the question remains whether this is because we have to do with an objective universe built of such units, or whether it is because our form of thought is such as to recognize only systems of analysis which shall yield parts precisely like one another. Our previous discussion has committed us to the latter as the true explanation. We have claimed to be able to determine by *a priori* reasoning the properties of the elementary particles recognized in physics—properties confirmed by observation. (123)

One is perhaps beginning to see that Eddington's claim to have deduced the so-called cosmical number 136 x 2256 may not be quite so absurd after all.

It is safe to say that when it comes to his subjectivist interpretation of particles, few scientists, so far, have sided with Eddington. It should however be pointed out that the findings of Roy Frieden, to which I have already alluded, do lend strong support to that contention as well. The first indications in that regard can be found in Frieden's monograph, which demonstrates that there is indeed a connection between the information-theoretic quantities, I and J, and the physics of corresponding particles. For example, it turns out that "the intrinsic information I in the four-position of a free-field particle is proportional to the square of its relativistic energy mc2," and that "the constancy of the particle rest mass m and Planck's constant h is implied by the constancy of J."8 Now, the fact that propositions of particle theory can thus be translated into the language of information theory does indeed suggest very strongly that we may be dealing, ultimately, with

information-theoretic conceptions. Meanwhile research in the applications of EPI to particle theory is yielding results; as Roy Frieden exclaimed during a recent phone conversation: “We are now getting particles!” But then, how could one “get particles” from an analysis of the measuring process unless it is the measuring process itself that gives rise to these particles? Never before have Eddington’s subjectivist contentions appeared more plausible from the standpoint of physics.

8. B. Roy Frieden, *Physics from Fisher Information* (Cambridge University Press, 1009), p.276.

The theoretical analysis of things physical into particulate parts goes hand in hand with corresponding experimental means designed to effect the desired decomposition. As Eddington puts it: In examining microscopic phenomena, we have to bear in mind the Procrustean methods of the experimenter which contrive to supply what our frame of thought demands. Like the sculptor, he renders visible the parts or combinations of parts which our analytical imagination creates; or at least his sorting and manufacturing operations produce effects which humour our belief that the parts are there. (131)

The logic of Eddington’s thought leads inescapably to the final conclusion: “The fundamental laws of physics are simply a mathematical formulation of the qualities of the parts into which our analysis has divided the universe; and it has been our contention that they are all imposed by the human mind in this way, and are therefore wholly subjective.” (131) I would only add that, strictly speaking, the term “qualities” as applied to the parts is inappropriate, and could properly be replaced by the term “relations.” Physics, then, has to do with the relations between parts which its own analysis has introduced.

There are those who think that the mathematical structures discovered by the physicist are simply there, even as Mt. Everest, say, is simply there; but Eddington disagrees:

Theoretical physics is highly mathematical. Where does the mathematics come from? I cannot accept Jeans' view that mathematical conceptions appear in physics because it deals with a universe created by a Pure Mathematician: my opinion of pure mathematicians, though respectful, is not so exalted as that. (137)

Eddington's point is that "The mathematics is not there till we put it there." Moreover, we begin to "put it there" the moment we define the most basic of all measures: the measures of spatial distance, namely, and of temporal duration. According to Eddington's analysis, this step entails the mathematical theory of groups, which consequently stands at the base of our physics. It is by means of mathematical groups, constituted by what Eddington calls "terminable sets of operations" (140), that mathematics gains a foothold, so to speak, on the ground of external reality.9 Or better said: on the ground of human knowledge; for as we have seen, it is Eddington's contention that the mathematics pertains, not to the world as such, but to our *knowledge* of the world. It is in a sense subjective: we ourselves have put it there. And this means that the physical universe—the universe "so described"—is likewise subjective in precisely the same sense: i.e., because it is constituted by mathematical structures which the physicist himself has imposed. This, then, is Eddington's central point, and ultimately his *only* point: the conclusion to which all his arguments lead.

But let us continue. Starting with terminable sets of operations, one arrives at the abstract mathematical group, in which the original operations are represented by symbols, such as the x, y, and z of algebra, which now function as undefined elements. What counts—and this is indeed the crux of the matter!—are not of course these symbols, but the mathematical structure represented by their means: it is this structure, and this alone, that has physical significance. As Eddington clearly explains:

9. What thus enters into the foundations of physics are certain special groups, such as the group of rotations in six-dimensional space.

Physical science consists of purely structural knowledge, so that we know only the structure of the universe which it describes. This is not a conjecture as to the nature of physical knowledge; it is precisely what physical knowledge as formulated in present-day theory states itself to be. In fundamental investigations the conception of group-structure appears quite explicitly as the starting point; and nowhere in the subsequent development do we admit material not derived from group-structure. The fact that structural knowledge can be detached from knowledge of entities forming the structure gets over the difficulty of understanding how it is possible to conceive a knowledge of anything which is not part of our own minds. So long as the knowledge is confined to assertions of structure, it is not tied down to any particular realm of content. (142)

It might seem, at first glance. that Eddington has simply enunciated the Aristotelian and Thomistic doctrine of knowledge: it is by way of a form that we know an external object. But one must remember that the knowledge of which Aristotle and Aquinas speak is *objective*: we know the very form that resides in the object (be it a substantial or an accidental form). Why, then, is the knowledge of mathematical forms or structures said to be subjective? And does this not contradict Eddington's claim that it is precisely by way of mathematical forms that the physicist *is* able "to get out of his mind" and make contact with the external world? There is however no contradiction here. Yes, it is indeed by way of the mathematical forms that the physicist gains knowledge of the external world; Eddington's point, however, is that the forms in question have been artificially imposed: "The mathematics is not there until we put it there." And it is for this reason, and in this sense, that our knowledge of mathematical structures—our knowledge of the physical world!—is said to be subjective.

The so-called physical universe—"the world so described"—turns out to be constituted by mathematical structures which we ourselves have imposed; in a word, it proves to be "man-made." Yet this way of putting it is also misleading; for inasmuch as physical knowledge is partly objective, "the world so described" must be "partly objective"

as well. One is left with a curiously equivocal conception, which may enlighten the wise but is bound to deceive the unwary.

One thing, at least, is certain: if there be a “man-made” world, there must also be a world which is *not* man-made. And to be sure, Eddington himself alludes occasionally to that other world: “I have referred also to an objective universe,” he writes, “which cannot be identified with the universe of which the above-mentioned knowledge [the knowledge of physics] forms a description.” (158) But what exactly does Eddington have to tell about that other world?

What is the nature of that universe which stands “behind” the physical? And how do we *know* that universe? In fact, do we know it at all? Physics informs us how that world interacts with the strategies of the physicist: it tells us what “answers” Nature gives to the physicist’s questions; but is that all we know?

It will be instructive to recall the conception of Eddington’s “two tables,” of which he tells in the Introduction to an earlier book: “I have settled down to the task of writing these lectures and have drawn up my chairs to my two tables. Two tables! Yes; there are duplicates of every object about me—two tables, two chairs, two pens.”10 And he proceeds to explain that the first of the two tables is the perceptible, the one with which we are familiar in daily life, whereas the second is the molecular table, which we do not perceive. At first glance it may seem that Eddington is distinguishing between what I have termed the *corporeal* domain and the physical, and that his “other universe” may in fact be the corporeal: the world in which the perceivable table is contained. But this proves not to be the case. The surmise is negated (some 260 pages later) when Eddington has this to say on the subject of sense perception:

When messages relating to a table are travelling in the nerves, the nerve-disturbance does not in the least resemble either the external table that originates the mental impression or the conception of the table that arises in consciousness.11

10. *The Nature of the Physical World* (London: J.M. Dent, 1935), p.5.

11. Ibid., p.268.

He then proceeds to describe the complex process by which the "nerve-disturbance" is transformed into the perceived table, an operation accomplished "partly by instinctive image-building inherited from the experience of our ancestors, partly by scientific comparison and reasoning." He concludes that "by this very indirect and hypothetical inference all our supposed acquaintance with and our theories of a world outside us have been built up."

Here we have it at last: the old Cartesian philosophy! The "first table," it turns out, has been relegated to the nebulous realm of consciousness; as we might have surmised from the start, Eddington is bifurcationist in his *Weltanschauung*. The "external table" has thus to be inferred from phantasms conjured up somehow in response to nerve messages to which the former gives rise. What presently concerns us, however, is the objective world; or more precisely: our knowledge of that objective world. Assuming that the aforesaid leap of inference can be accomplished—a big assumption, to be sure!—the question is whether it lands us in the objective universe, or in the physical. And given that it is by way of mathematical structure that we do "get out of our mind," the answer is clear. What we arrive at can be none other than "table number two": the molecular table belonging to the *physical* world. On the basis of Eddington's philosophical postulates, there is no way out of the impasse: the objective universe remains perforce *unknown and unknowable.*

But then, if that be so, how does Eddington know that there *is* an objective world, a world "beyond" the physical? Eddington appears to be suspicious of ontological claims: "It is an advantage of the epistemological approach that the question of attributing a mysterious property called 'existence' does not arise" (156) he tells us. What he apparently means is that in speaking of things that we know, the term "existence" ceases to be "a mysterious property" and becomes simply a way of saying that we do know the things in question. "I myself," he explains, "often say that atoms and electrons exist. I mean, of course, that they exist—or are—in the physical

universe, that being the theme of discussion." (156) Well and good; yet the fact remains that in alluding to an objective world—a world which, according to his own premises, we do not and cannot know—Eddington has evidently forfeited what he terms "the advantage of the epistemological approach": he has left the comparatively safe ground of phenomenology to venture onto metaphysical turf.

Unwittingly, it would seem, and against his stated intentions, he has become a metaphysician. And a metaphysician of the worst kind, I would say: a *Cartesian* metaphysician, that is.

Eddington was of course cognizant of the fact that philosophers held opinions at variance with his own. He was aware, in particular, that L. Susan Stebbing, in a book entitled *Philosophy and the Physicists*, had taken aim at the position he espoused. "Some of the pure philosophers," he notes, "deny that the scientific description applies to the objects which in ordinary speech are called physical objects.12

12. It may be surmised that Eddington is alluding chiefly to G.E. Moore and A.N. Whitehead.

Their opinion is voiced by Prof. Stebbing: 'He [the physicist] has never been concerned with *chairs*, and it lies beyond his competence to inform us that the chairs we sit upon are abstract'." (159) Eddington does of course perceive the enormous implications of Stebbing's contention: "If the physicist is not concerned with chairs," he goes on to say, "the astrophysicist is not concerned with stars. There is one Professor of Astrophysics, Prof. Dingle, who has not been afraid to recognize this logical conclusion." What, then, is Eddington's response? "Prof. Dingle, like Prof. Stebbing," he tells us, "has dropped the outlook which determines the familiar use of words, and has strayed into a world where men look at things in the way philosophers would have them look, and language is diverted to describe these things which philosophers consider most worth attention." (160) But here, quite clearly, Eddington has it exactly backwards: it is the bifurcationist—the individual who takes such a familiar object as a chair to be a phantasm residing in our brain or

consciousness—that has “dropped the outlook which determines the familiar use of words.” It is he that has “strayed into a world where men look at things in the way philosophers would have us

look”: the way *Cartesian* philosophers would have us look, to be precise. Ask anyone who happens *not* to be a philosophically educated intellectual!

I need not belabor the point: it is far too obvious. What is truly strange and indeed problematic, on the other hand, is that Eddington himself should have failed to see the absurdity of his claim: that he seems not to notice that in ordinary speech a chair is *not* an aggregate of quantum particles or a Schrödinger wave function in Hilbert space! I find it surprising that he seems not to recognize the incongruity of sitting on an aggregate of quantum particles, especially after we have been told that these aggregates are “partly subjective”: how can one sit on a “partly subjective” chair? And for that matter, how can one sit on a “mathematical structure”? My colleagues in mathematics would find this hard to comprehend. What is missing in mathematical structures, of course, is *substance*: the very thing that has been “filtered out” by the physicist. A chair without substance, it turns out, cannot be sat upon.

Clearly, in responding to his philosophic critics, Eddington has been drawn out of his element and into a realm far removed from the domain of his own expertise. Gone are the lucidity and quasi-mathematical precision of his former discourse, when he lectured us on the nature of the physical universe, following what he termed the method of epistemological analysis. It was here, on what is inherently phenomenological ground, that he arrived at those major insights, the validity of which physicists are only now beginning to confirm. So long as he remains faithful to his epistemological approach, all is well; but Eddington’s doctrine becomes muddled the moment bifurcation comes into play. Understandably so: phenomenology of any kind and bifurcation do not marry. It was Edmund Husserl, after all, the father of phenomenology, who fired the first salvo against bifurcation, and thus awakened the philosophic

world from its Cartesian slumber. Yet to this day the scientific community has paid little heed. With very few exceptions, scientists remain committed, at the most fundamental level of their thought, to the Cartesian philosophy, which they have imbibed at a tender age, and have been too busy, ever after, to question or investigate.

My point is that bifurcation constitutes a foreign element in Eddington's philosophy. The postulate is extraneous to that philosophy and only generates confusion and inconsistency. What is more, it seems that bifurcation actually goes against Eddington's philosophic instinct and better judgment, and could only assert itself in his thought because it was never detected as the unwarranted postulate it is. If Eddington had been able to apply himself, in particular, to the problem of human perception, his views with regard to the "first table" would no doubt have been vastly different. In keeping with his philosophic bent, he would then have discovered that here too "the concept of analysis" has come into play, with the result that one has covertly replaced the living organism by an artificial model, a mere aggregate of parts, bereft of life and consciousness. But obviously his opinions on that subject are not his own, and when he speaks of nerve impulses, image formation, and the like, he is simply repeating the conventional wisdom. It was in fact left to James J. Gibson, the Cornell University psychologist, to apply the "epistemological method" to the problem of human perception, and in so doing, to lay that conventional wisdom to rest.13 Eddington, I suspect, would have been delighted had he lived to see the day. He would, I think, have recognized the American as a kindred spirit: another hard-headed scientist with little patience for humbug. But let us not forget: it took Gibson decades of painstaking research—much of it experimental—to arrive at his epoch-making conclusions; and obviously, Eddington was otherwise occupied.

13. See especially James J. Gibson, *The Ecological Approach to Visual Perception* (Hillside, NJ: Erlbaum, 1986). For a summary and philosophical interpretation of Gibson's theory I refer to Chapter 4 in my book, *Science and Myth,* op. cit.

Strictly speaking, Eddington *has* no worldview: his postulates preclude that the world can be "viewed" at all. The problem lies in his refusal to admit human sense perception as a means of obtaining a more-than-physical knowledge of the external world. Nothing would be more natural, I say, and indeed more in keeping with the logic of Eddington's thought, than to suppose that the objective world houses such familiar things as Professor Stebbing's chairs; but as we have seen, at this juncture Eddington turns Cartesian.

He need not have done so. The whole purpose of the Cartesian axioms was to replace the perceptible realm by the physical: that imagined mechanical world of bygone days, made up of so-called *res extensae*. It was for this that the familiar objects had to be exiled, banned to the limbo of consciousness. But as one knows today, that postulated mechanical world has proved to be chimerical: physicists no longer believe in a clockwork universe. The realization has dawned that the physical universe—the world of the mathematical physicist—is indeed "partly subjective"; and it was Eddington himself who refined and systematized that recognition, better by far than anyone else. Where then is the necessity, let alone the justification, for the Cartesian postulates? It was belief in a mechanical universe that dethroned the perceptible world some three centuries ago; but today the picture has changed. With the demise of the imagined Cartesian *res extensae*, the door has been opened to the restitution of the perceptible realm. Awakened from his Galilean slumber, the scientist would be free once more to accept what mankind has believed all along: the fact, namely, that we do look out onto the world.

But there is more to be said on this question: I shall argue that the very logic of Eddington's approach calls for the aforesaid restitution of the perceptible realm. It is by way of sense perception, after all, that we know the scientific instruments which constitute the concrete or non-mental component of Eddington's "net." And it is by means of this "net," let us recall, that we define and impose the mathematical structures that constitute the physical domain. Does it make sense, then, to maintain that the concrete instruments of the experimentalist

are *physical*? Strictly speaking, it does not: a case indeed of putting the cart before the horse. The physical belongs, after all, not to the objective world, but to “the universe so described”; as Eddington says, it is “partly subjective.” What is needed, however, are *objective* instruments! What one requires, obviously, are *instruments*, not “instruments so described”! I contend that one can no more measure with *physical* instruments than sit on a wave function.

What saves the day for physics, of course, is the fact that the experimentalist does *not* accept the Cartesian philosophy, which is to say that he treats his apparatus not as a mathematical structure, but as a perceivable object. Even as there are said to be “no atheists in the trenches,” so indeed there are no bifurcationists in the laboratory. All knowledge of the external world begins in the perceptible realm: deny the perceptible object, and nothing external remains.

Deny, in particular, the perceptible apparatus of the experimentalist, and you have denied Eddington’s “chisel” and “net”: the very center of Eddington’s doctrine has then been negated.

Having identified sense perception as the primary means of knowing the external world, it now behooves us to reflect upon that claim. How *do* we “get out of our mind” to perceive an external object? Eddington informs us that the physicist gets out of *his* mind by way of mathematical forms: “The fact that structural knowledge can be detached from knowledge of entities forming the structure gets over the difficulty of understanding how it is possible to conceive a knowledge of anything which is not part of our own mind.”

Now, something strictly analogous can be said in regard to sense perception: here too the external object is known by way of *forms*; it is only that in this case the forms in question are not mathematical: if they were, we would evidently perceive, not tables and chairs, but mathematical structures. No one, moreover, has ever perceived a mathematical structure: as has long been recognized, one arrives at mathematical structures, not directly by way of perception, but by a process of abstraction that denudes a perceptible object of its sensible qualities.

How the forms by means of which we perceive are transmitted from the perceived object to the percipient is a question with which we need not presently concern ourselves; what matters is that these forms *are* transmitted, and that they constitute the connecting link between the knower and the known.14 We know the very forms that subsist in the object, the very forms, in fact, which *constitute* the object. We must not however interpret this doctrine simplistically; the fact that an object is known by the very forms which constitute that object does not mean that it is known "without residue." As a matter of fact, it happens that in the very act of knowing we know the object to be "more" than what is given, more than what we are able cognitively to possess. In a word, we perceive the object as a *transcendent* entity. The perceived object is transcendent, moreover, not simply because it has an existence of its own, but because it conceals within itself an immensity, an unfathomable depth. It is of course in the poet, the mystic, and the authentic philosopher that these recognitions come to the fore; and yet some inkling, at least, of that transcendence, of that hidden immensity, constitutes an essential component of all human perception—so long as that perception *is* in fact human.

14. For an in-depth discussion of this question, I refer again to my chapter on

"The Enigma of Visual Perception" in *Science and Myth*, op. cit.

Likewise, in defining the corporeal domain as the perceptible, it needs to be understood that the corporeal is in a way *more* than what is perceptible. The human eye, for example, does not perceive light above or below a certain range of frequencies, nor does it perceive objects outside a certain intermediary range of spatial magnitiude; and in any case, it perceives only the external surface. And yet it is by way of sense perception, limited though it be, that we know corporeal objects to the extent that we do. The corporeal universe, then, is precisely the world to which human sense perception gives access. And this indeed is *our* world: the one in which we find ourselves. This corporeal universe, moreover, is in fact

the only *objective* world which our human faculties—sensory *and* mental—allow us to know. We do also, to be sure, have knowledge of the physical universe, which is categorically imperceptible and hence is not corporeal; but as Eddington shows, that physical universe is *not* in fact objective. It needs to be understood once and for all that the corporeal universe does indeed constitutes the one and only objective world we presently know, and that sense perception constitutes indeed our one and only means of knowing that objective world.

One thing more needs now to be said. Having noted that the perceived entity is experienced as something transcendent, I wish to point out that it is by virtue of this very transcendence that the given entity presents itself as something more than a percept: as an *object*, namely. Transcendence proves thus to be the hallmark objectivity.15 And let us observe that in the case of a *physical* object, rigorously conceived, no such transcendence can be discerned. Strictly speaking, a physical entity is simply the mathematical object it is defined to be; as Eddington explains: “It has come to be the accepted practice in introducing new physical quantities that they shall be regarded as *defined* by the series of measuring observations and calculations of which they are the result.” (71) No place here for transcendence, that “more” which is the criterion of objective reality. The physical entity has been sharply defined, cut down to size so that it can be manipulated with mathematical precision. Those who wish to think of it as “some entity disporting itself in some metaphysical realm of existence” Eddington goes on to say, “do so at their own risk; physics can accept no responsibility for this embellishment.” It happens, of course, that physicists do tend habitually to “embellish” their objects thus by conceiving of them *objectively*, and thus indeed *meta-physically*; but this is another matter. What concerns us presently is not the *scientistic* universe—the world as depicted in our contemporary scientific imagination—but the *physical* universe, rigorously conceived according to the canons of physics. And in that universe an entity *is* what it is defined to be, and nothing more. No room for transcendence here, as I have said;

the very nature of the scientific process guarantees as much: such is the price of mathematical exactitude.

15. The fact that an object is perceived as transcendent does not of course guarantee its objectivity: I am not denying the possibility of error. To err is human, after all. For a discussion of “false” perceptions (which can be of various kinds) I refer again to Chapter 4 in *Science and Myth*, op. cit.

It has long been debated whether mathematical entities exist in some Platonic world of their own; yet whatever the case may be, it is quite evident that they do *not* exist here on earth, that is to say, in what is for us the objective universe. The case is similar, thus, to that of *physical* objects: these too, as Eddington discovered by way of his epistemological reflections, do not exist objectively. This conclusion could moreover have been foreseen directly: from the conspicuous lack of transcendence, namely, on the part of physical objects, which does indeed constitute a sign of subjectivity. Nothing that is “closed,” nothing that is strictly finite or rigorously circumscribed, can exist objectively. Transcendence is truly the hallmark of objective reality, as we have said. Once again: “Exactness is a fake.”

The question arises now: if physical entities do not exist objectively, in what sense do they exist at all? Must we suppose, perhaps, that they exist simply “in the mind of the physicist”? Could it be Eddington’s *second* table (the physical), in fact, which resides in the limbo of consciousness? Certainly not! As “partly subjective” entities, physical objects must occupy a middle ground; and that middle ground must evidently be specified through the economy of measurement. Lord Kelvin was right: physics *is* the science of measurement. Only it must be understood that measurement is not in truth the discovery of something that already exists—as one had imagined in Lord Kelvin’s day—but constitutes a creative act: to measure is to determine, to limit, to impose a bound. It is to be noted, moreover, that the act of measuring is always accomplished by means of a corporeal instrument, and that the outcome or result is

registered in a perceptible state of the measuring instrument (for example, in the position of a pointer on a dial).

What, then, is the physical? Thus posed, the question can be readily answered: the physical, one now sees, is precisely *the measurable*. What else could it be, seeing that it is neither the measuring instrument nor the result of measurement! But what *is* the measurable? Could it be a particle, for instance? It could not be a "classical" particle, certainly, because such a particle is fully determined and consequently *not* measurable: one must remember that measurement entails the *imposition of a bound*. The measurable must therefore be indeterminate, yet capable of receiving determination. Not "fully indeterminate," to be sure; the latter notion would be as chimerical as that of a classical particle, which is its logical opposite.

The measurable, thus, must be situated between these two extremes. Though reminiscent in certain respects of Aristotle's *potentiae*, it is more than that; for the measurable in the sense of physics carries a certain tendency, which in fact can be conceived in mathematical terms: as a *probability*, to be exact. The measurable, one finds, is thus in effect a probability. It is by way of probabilities, it turns out, that Nature outwits our two-valued logic of "being" and "nothingness": for indeed, a probability is neither the one nor the other, but does evidently occupy a middle ground.

The notion is philosophically difficult, and even Eddington seems to vacillate in regard to what these probabilities are. At one point, for example, he tells us that "The introduction of probability into physical theories emphasizes the fact that it is knowledge that is being treated. For probability is an attribute of our knowledge of an event; it does not belong to the event itself, which must certainly occur or not occur." (50) Yet, if probability is indeed an attribute of our knowledge, it should tell us something about the object or system that is known. According to quantum theory, in fact, probabilities are all that we do know in the physical world.16 As Eddington points out: "Wave mechanics investigates the way in which probability redistributes

itself as time elapses; it analyses it into waves and determines the laws of propagation of these waves." (51) One is beginning to think that these waves are real! But almost immediately he adds that "a sudden accession of knowledge—our becoming aware of a new observation—is a discontinuity in the 'world' of probability waves," suggesting once again that these probability waves pertain to our knowledge alone—as if they did not, by that very fact, belong also to the physical world. It needs to be understood, moreover, that the discontinuity in question arises not simply from an "accession of knowledge—our becoming aware of a new observation," but from that new observation itself, whether we become aware of it or not. What counts is the interaction of the measuring instrument with the physical system that is being measured: it is this that causes the so-called collapse of the wave function. Some forty pages later, however, it appears that Eddington adopts at last an unequivocally realist interpretation of probabilities: "I must still keep hammering at the question, What do we really observe?" he writes. "Relativity theory has returned one answer—we only observe *relations*. Quantum theory returns another answer—we only observe *probabilities*." Here we have it: what we "really observe" are probabilities. The circumstance, moreover, that relativity theory gives a different answer does not alter this fact: Eddington clearly accepts quantum theory as the more accurate and indeed the more fundamental of the two theories. The conclusion stands: *probabilities are "what we really observe*."

16. Strictly speaking, "all that we do know" are *data values*, as Professor Frieden has kindly pointed out. Probabilities, thus, are not "known," but inferred. They are "all that we *can* infer."

But if there are indeed probabilities, there must also be things which are *not* probabilities; a probability is after all the probability of something which itself is not a probability. In addition to probabilities, thus, there are also events "which must certainly occur or not occur," to put it in Eddington's words. A distinction needs therefore to be drawn between two kinds of facts; as Eddington explains:

Probability is commonly regarded as the antithesis of fact; we say 'This is only a probability, and must not be taken as a fact.' What we mean is that the result of an observation, though undoubtedly a fact in itself, is only valuable scientifically because it informs us of the probability of some other fact. These secondary facts, known to us only through probabilities, form the material to which the generalizations of physics refer. (89)

We must not fail to observe that in this somewhat obscure passage the distinction between the corporeal and the physical domains lies concealed. Eddington alludes to two kinds of facts: the result of an observation, namely, and the so-called "secondary facts, known to us only through probabilities," which are said to "form the material to which the generalizations of physics refer." Now the result of a measurement, as we have seen, is realized in the perceptible state of a corporeal instrument: it is thus a "corporeal" fact, the kind which are not probabilities. The "secondary facts," on the other hand, refer evidently to the physical domain, the domain in which facts *are* probabilities, or are "known to us only through probabilities," which amounts to the same.

The realization that "we only observe probabilities" proves to be basic; and I would point out that Frieden's EPI approach substantiates this most forcefully. The carrier of Fisher information, after all, is none other than a probability distribution. There is an input probability distribution, corresponding to the "bound" information J, and an acquired probability distribution, corresponding to I, from which the measured value is sampled; it is here that probability collapses, so to speak, into fact (fact of the first kind, in Eddington's enumeration). Up to that final point—which is moreover impenetrable to mathematical analysis—the measuring process has to do with probabilities: "The basic elements of EPI theory," writes Frieden, "are probability amplitudes."17 What takes place in measurement is a transmission of probabilities, which gives rise to a corresponding transmission of Fisher information from J to I; and it is Frieden's monumental discovery that this very process determines the physics of the measured phenomenon in the form of an output

law. As Frieden explains: “EPI regards each such equation as describing a kind of ‘quantum mechanics’ for the particular phenomenon.”18 This holds true, moreover, even when one derives seemingly “non-quantum” results via EPI: the classical electromagnetic four-potential, for instance, can now be regarded as a probability amplitude for photons; or again, the gravitational metric tensor in Einstein’s general theory becomes a probability amplitude for so-called gravitons. According to EPI, *all of physics* is a quantum theory; how could it be otherwise if “we only observe probabilities”?

17. Op. cit., p.83.

18. Ibid., p.84.

What then, let us ask, *is* a probability? Now, the defining characteristic of a probability, clearly, is that it is the probability of something which itself is *not* a probability. And when it comes to the probabilities of quantum theory, that “something” is of course none other than the result of a measurement, as given, say, by the position of a pointer on a scale. It is here, in this transition, that a probability reveals its nature; and let us not fail to observe that this very transition—which in the standard formulation of quantum theory reveals itself in the phenomenon of wave function collapse—presents itself as an indeterminacy.

Let us reflect upon this fact, which proves to be of the utmost importance. If probabilities are what we really observe, they must be at least “partly objective”; but then, if it be true that transcendence is indeed “the hallmark of objectivity” (as we have said), must they not reveal that partial objectivity in some mark of transcendence? Now, that mark of transcendence, I say, stares us in the face: it is obviously none other than the so-called quantum indeterminacy of wave function collapse. By way of this crucial enigma

Nature contrives to outwit our simple logic: by this physically inexplicable “collapse” into objective fact the probabilities of physics manifest their transcendence: at this very moment they reveal their objective side by violating the Schrödinger wave equation, which up

to that point they had strictly obeyed.19 In a “flicker of transcendence” as it were, they announce their partial objectivity, and thus their partial subjectivity as well: for the statement itself is made, not on the physical plane of probabilities, but on the plane of *corporeal* fact, that is to say, in a perceptible state of a corporeal instrument.

The entire mystery of the physical is in a way revealed in the spectacle of wave function collapse: no wonder the phenomenon has been pondered and debated since the advent of quantum theory! And no wonder that it continues to baffle the serious-minded physicist: for it happens that the probabilities of quantum physics announce their objectivity precisely by *violating* the quantum-mechanical equations. In a momentary burst of non-compliance, one could say, they prove to be *more* than a mathematical abstraction, more than a mere *ens rationis*, more in fact than just an imprint of Eddington’s “net.” By their momentary breach of “exactness” the probabilities of physics attest that they are *not* “a fake.”

19. According to the EPI approach, the Schrödinger wave equation is not violated but “re-initialized” as Professor Frieden points out, which however amounts to the same.

It behooves us now to return to Eddington’s “two tables” to see where the matter finally stands. We have taken the pre-Cartesian and indeed “normal” position, which affirms that the perceived table is situated, not “in consciousness,” but in the external world: it is the real table, we contend, the one and only table that objectively exists.

But where exactly does this leave the physical table: the one composed of atoms or particles? We have rejected the idea that Eddington’s two tables have simply changed places, so that it is now the molecular table instead of the perceived that is relegated to the realm of consciousness, the Cartesian *res cogitans.* But this means that *both* tables are now situated in the external world: how can that be? Could the second be conceived perhaps as a kind of ghost-like double pervading the corporeal imperceptibly? That would be an “embellishment” tantamount to corporealizing the physical. No matter

how thin or ethereal we picture that “ghost” to be, it remains perforce a corporeal entity; but “things physical,” it turns out, are *not* corporeal, nor are they, strictly speaking, “things”: the fact that they are characterized in terms of *probabilities* should suffice to make this clear. The idea of the “ghost-like double” needs therefore to be rejected.

What is actually observed, we have said, are the probabilities of physics. They constitute the objective reality which underlies modern physics, the bedrock upon which the edifice of modern physics rests. As that which is actually observed, they—and they alone!—cannot be assigned to a model or representation. But neither, as we have seen, can they be assigned to the objective universe, which proves to be none other than the corporeal: as Eddington points out, the probabilities of physics are indeed facts, but facts “of the second kind” inasmuch as they cannot be separated from the economy of measurement. They are thus “partly subjective” as we have said, or facts of the “participatory universe” to put it in John Wheeler’s felicitous phrase.20

20. “All things physical,” writes the Princeton physicist John Wheeler, “are information-theoretic in origin, and this is a participatory universe.” This remarkable statement is (understandably!) quoted on page 1 of Frieden’s book.

It appears that the enterprise of physics has given rise to a new ontological domain, a new stratum or substratum of reality. By virtue of its “participatory” nature it turns out however that the physicist himself determines the contours of that so-called universe.

What then, let us ask, is its ontological status? The answer has by now become clear: *the physical stands to the corporeal as potency to act*, to put it in Scholastic terms. This is what the aforesaid Eddingtonian considerations force us to conclude: the recognition that “what is actually observed” are finally *probabilities* implies as much.

What Heisenberg affirmed with reference to fundamental particles applies consequently to the physical universe at large: stripped of its imaginary “embellishments,” it too is “a strange new entity midway between possibility and reality.” Metaphysically speaking, that so-called universe constitutes a *materia secunda* situated between *materia prima* or pure potency and the corporeal domain.21

21. For a fuller discussion of these issues I refer, in the first place, to my monograph, *The Quantum Enigma,* op. cit. See also *Science and Myth*, op. cit., Chapters 2 & 3.

3 The Ontology of Bell’s Theorem

In the present chapter I propose to examine the quantum-mechanical notion of “non-locality” in light of traditional ontology. The text is based upon a lecture delivered in 1988, in which, perhaps for the first time, an aspect of the quantum-reality problem was dealt with from a metaphysical point of view.

I will begin by recalling certain well-known quantum facts which came into scientific view near the turn of the century, precisely at the moment when a victorious physics seemed to be closing in upon the long-conjectured atoms and the fundamental particles of which they now proved to be made. What happened in that final moment, so to speak, is that the quarry has mysteriously eluded our grasp: for in light of experimental scrutiny these so-called fundamental particles exhibited a hitherto unsurmised wave aspect, implying that they were not, strictly speaking, particles at all. The underlying reality, therefore, proved to be an unknown, an X, which under appropriate conditions can exhibit both particle and wave characteristics, and hence cannot be conceived in classical terms.

What this X is in its own right, no one knows; the quarry, as I have said, has quite eluded our grasp.

To be sure, what is actually observed—what registers on our instruments of detection as a condensation track, or a flash of light

on a phosphor screen, or as a spot on a photographic plate—is indeed the particle aspect, or the particle as we continue to say. The wave aspect, on the other hand, manifests itself indirectly through statistical laws governing the observed behavior of the so-called particles. For instance, if a beam of electrons is passed through a small round aperture, what appears on the phosphor screen, or on the photographic plate, is a pattern of concentric bands (resembling an archery target). Now, this is none other than the so-called Airy pattern, named after the British astronomer George Biddel Airy, who demonstrated, back in 1835, that such concentric bands can be explained mathematically in terms of the diffraction and interference of an impinging wave. Thus, in the statistical distribution of the individual electron encounters with the screen or plate, the electron beam acts as if it were a wave. Oddly enough, moreover, one gets exactly the same Airy distribution whether the electrons are passed through the aperture in vast numbers or sparsely, even one electron at a time. A single electron, therefore, has both a wave and a particle aspect. And whereas the particle aspect suggests that the X in question is discrete and localized, the wave aspect entails that it must be continuous and somehow spread out over the entire space of the experiment.

Such, in brief, are the quantum facts which brought the Newtonian age to an abrupt end. It quickly became apparent that the classical formalism of mathematical physics was inherently incapable of coping with the phenomenology of the newly-revealed quantum world; and by 1925, following a quarter century of theoretical chaos, a new and radically different fundamental theory came to birth.

And this “quantum theory,” as it came to be called, has proved to be a brilliant success. In its application to countless problems it has never yet failed, never yet yielded an incorrect response. It is truly a marvel, a scientific triumph.

However, there is one great problem with this marvelous theory, which is that by its very form it gives us no information—no inkling, even—concerning the nature of physical reality as such.

The theory tells us, with uncanny precision, what our instruments of detection will register when a beam of electrons, for example, is subjected to certain conditions; but it tells us nothing whatsoever concerning the electron as such. Speculations aside, we do not actually know, for instance, whether the electron owns its dynamic attributes (such as position or momentum) *before* it is observed—whether it is thus what physicist term an "ordinary object," or whether these dynamic attributes are in fact "contextual" (which would mean that they exist *only* in the context of an actual measurement). It is basically the old conundrum whether external objects exist when there is no one present to perceive them—but with a very modern twist: for indeed, the problem today is whether it is actually possible to conceive of a noumenal quantum reality in such a way as not to contradict what we know about phenomena.

This is the issue which stands at the heart of the so-called quantum-reality problem, on which physicists have been sharply divided. As far back as 1927, when the heavyweights of physics gathered in Brussels to assess what, if anything, was still left of the Newtonian *Weltanschauung*, Niels Bohr and Albert Einstein took up diametrically opposing positions on this issue, which have polarized the debate ever since. What Bohr maintained, basically, is that in regard to quantum phenomena we must be satisfied with the pragmatic kind of information quantum theory itself delivers: it is the best one can do, not because the theory as such is imperfect or incomplete (as Einstein charged), but because there is in fact no quantum reality *behind* the phenomena which could explain what is going on. "There is no quantum world," said Bohr. "There is only an abstract quantum description."

Einstein, on the other hand, argued with all his considerable might in favor of a realist interpretation. There *is* a "quantum world," he said in effect, a deep reality which underlies the phenomena and ultimately explains them: there must be! It was unthinkable to him that an "abstract quantum description," unsupported by any deep reality, could lead to correct predictions—as if by magic.

As it turned out, most physicists eventually joined the Bohr school of thought, which came to be known as the Copenhagen interpretation of quantum theory. In 1932, moreover, just five years after the Brussels conference, it seemed very much as though the Copenhagenist claims had been vindicated, once and for all, through the labors of a Hungarian mathematician by the name of John von Neumann. Having put the new quantum theory on a firm mathematical foundation, von Neumann went on to prove—with exemplary rigor!—that the idea of a physical reality made up of "ordinary objects" is in fact incompatible with the predictions of quantum theory. At this point it appeared to all but a few realist die-hards—led by the unconquerable Albert Einstein—that the issue was henceforth closed.

But in fact it was not. The realist position revived, phoenix-like, in 1952, when David Bohm, after extensive conversations with Einstein, succeeded in constructing an objective model of the electron which squared with the exacting demands of quantum theory. In the wake of the celebrated "von Neumann proof," Bohm had apparently accomplished the impossible. It thus became apparent that there must be an error, a loophole of some kind, in von Neumann's argument; and yet the great mathematician had done his work so well that it took another twelve years to find it. The riddle was finally solved in 1964 when a hitherto unknown physicist by the name of John Stewart Bell discovered that von Neumann had unwittingly made a hidden and indeed unwarranted assumption concerning the "ordinary objects" which quantum theory supposedly had ruled out. What von Neumann had presupposed—and what until then everyone had apparently assumed to be self-evident—was that the objects in question were "local" entities. Basically this means that they can only communicate with each other via known physical forces: via signals, therefore, which cannot propagate faster than the speed of light. It turns out that Bohm was able to obviate the von Neumann interdict precisely because his model of the electron did not in fact obey that stipulated condition: Bohm's electron happens not to be a *local* entity.

But this result—this decisive breakthrough!—proved to be only the first step in the unfolding of Bell's inquiry. Basing himself on the fundamental principles of quantum theory, he succeeded in proving that reality, be it ordinary or contextual, *must* in fact violate von Neumann's locality condition. It thus turns out that the locality postulate is not only unwarranted, but proves actually to be untenable: in a word, *reality is nonlocal*. This is the epochal discovery which has come to be known as Bell's theorem. It has since been verified experimentally on the basis of an inequality likewise discovered by Bell, which moreover does not hinge upon quantum theory; the result, therefore, appears to stand solid as a rock. But whereas most physicists today accept Bell's theorem as well-founded, a few continue to be skeptical, and have left no stone unturned in an effort to thwart Bell's conclusion. And perhaps rightly so, considering that *de jure* the affirmation of nonlocality revolutionizes our worldview: it is not without reason that Berkeley physicist Henry Stapp refers to Bell's theorem as "the most profound discovery of science."1

1. "Bell's Theorem and World Process," *Il Nuovo Cimento*, 40b (1977), p.271.

What makes it so is the fact that its conclusion points beyond the spatio-temporal universe, the domain to which, strictly speaking, physics is confined by the very nature of its *modus operandi*. The astounding fact is that, in the form of Bell's theorem, physics has been forced to admit its own boundedness, its incapacity to deal with the deeper strata of cosmic reality. Having, for centuries, claimed title to the objective universe in its entirety, physics has now been forced, on its own ground, to relinquish that cherished pretension.

Actually, the Copenhagenist disclaimer amounts to the same; the die, one can see in retrospect, had been cast with the discovery of quantum mechanics. What Bell did was to isolate and bring into the open a fundamental feature of quantum theory which had engaged physicists from the start: the existence, namely, and indeed the ubiquity, of what are nowadays termed "nonlocal" connections.

And that is a trait Einstein had in fact singled out as a fatal flaw of the new physics. Meanwhile however that seeming flaw has proved to be a fundamental truth indigenous to the quantum realm, an epochal discovery, in fact, which has revolutionized our very conception of physics. Yet, remarkably, it was by way of Einstein's "thought experiment" designed to discredit quantum theory that the aforesaid breakthrough was finally achieved. What ultimately stands at issue, one can now see, is whether or not the Einsteinian space-time constitutes the full locus of cosmic reality, as Einstein himself supposed. It happens that quantum theory gives answer to this question, and that answer proves to be negative. What clinches the matter, finally, is that the issue can be tested experimentally thanks to Bell's inequality, and the verdict is now in: on this point it is Einstein who has missed the mark. Contrary to what the great physicist believed, it happens that space-time itself is bounded; and this we now know on the strength of physics itself. As we have said, physics has at last declared its own incapacity to deal with the deeper strata of cosmic reality. Its domain has thus shrunk, as it

were, from the universe at large to a restricted class of phenomena; as one unusually astute and forthright quantum theorist has put it:

"One of the best-kept secrets of science is that physicists have lost their grip on reality."2

2. Nick Herbert, *Quantum Reality* (Garden City: Doubleday, 1985), p.15.

What is in fact required if one would "grasp reality" are certain fundamental conceptions pertaining to the traditional metaphysical wisdom of mankind, which I would like now to place before you.

We will take as our starting point the opening verse of Genesis: *In principio creavit Deus caelum et terram*. First of all, it needs to be clearly understood that the "beginning" in which God is said to have created the world is *not* to be conceived in temporal terms. It is definitely not "a moment of time," be it six thousand or fifteen billion

years ago; for as St. Augustine observes: “Beyond all doubt the world was not made *in* time, but *with* time.”

Regarding the second half of the biblical verse, we need to observe that what God creates is “*heaven and earth*”: not one thing, thus, but apparently *two*. Now that “heaven” and that “earth” may be taken to refer respectively to the spiritual and the material poles of creation, or more concretely, to a spiritual and a corporeal domain. The point, in any case, is not that God created two separate worlds—a heavenly and an earthly—but that the cosmos in its integrality comprises two complementary principles or components.

After all, if “heaven” and “earth” are brought into existence in a single creative Act (as the biblical verse affirms), it stands to reason that the two must constitute a single creation, that in conjunction they are one thing.

At this point, however, we need to avail ourselves of another fundamental insight: there must also be an intermediary principle or realm—a *metaxy* in the Platonist sense—for as Plato was perhaps the first to observe: “That two things of themselves form a good union is impossible.” So too St. Thomas Aquinas declares: “The order of reality is found to be such that it is impossible to reach one end from the other without passing through the middle.” One finds, therefore, that the cosmos in its integrality must comprise *three* ontological levels or degrees: in ascending order these are the corporeal, the intermediary, and the spiritual. Two crucial observations are called for at this point. It needs first of all to be noted that this ternary defines a dimension—a fourth dimension if you will— which in metaphysical parlance is termed *vertical.* In a word, the creation, metaphysically conceived, comprises an “above,” which moreover has obviously been lost in the contemporary *Weltanschauung.*

This is the first point; and the second is this: what holds for the creation at large holds true likewise for man: he too proves to be tripartite, composed as he is of *corpus, anima,* and *spiritus.* 3 Man proves thus to be more than a mere part of the universe—

incomparably more than an infinitesimal speck in the vastness of space-time!—but constitutes in truth a microcosm, a veritable universe in miniature.

3. This anthropology, which traces back to St. Paul, does not conflict with the more familiar *corpus/anima* anthropology rightly understood.

He too, thus, embodies a vertical dimension; whether he realizes it or not, he is half angelic and half earthly in his composition.

The creation is thus to be conceived as a hierarchy made up of three principal levels or tiers. The entire structure, moreover, can be most fittingly represented in the form of a symbolic circle, in which the center (or if you will, a central disc) represents the spiritual world, the circumference stands for the corporeal or “visible” universe, and the annular region in between represents the *metaxy* or intermediary domain. I would like to add that this symbolic circle—this veritable icon of the *cosmologia perennis*— was known to every major civilization. The great exception, of course, is our own: this profane post-medieval civilization, intellectually dominated by science, which has in effect reduced the cosmos to its lowest tier.

Having recognized the tripartite division of the integral cosmos, we need now to ask ourselves what it is that actually differentiates the intermediary from the corporeal plane. The answer to this question turns out to be simple, at least in principle: what distinguishes the corporeal domain from the intermediary is the fact that the former is subject to certain *quantitative* conditions or bounds from which the latter is exempt. These bounds, moreover, constitute the basic determinations which permit us to speak of space, time, and matter (or energy) in a precise quantitative sense. Think of a boundless expanse of water, let us say; and then suppose that a pot, having a certain size and shape, is immersed therein. Obviously the vessel divides what before was undivided, and introduces quantitative determinations which did not previously exist. We have here a simple model, if you will, a paradigm which enables us to understand, in the first place, that the substantial reality is one and the same on both ontological planes: water, after all, does not cease

to be water when it is poured into a pot. Clearly, the “vessel” does not affect the substance, but only gives rise to certain quantitative attributes, “accidents” in the Aristotelian sense.

Now, it needs to be clearly understood that the primary determinations which characterize the corporeal plane of existence are by no means subjective, or man-made, but derive precisely from the Fiat of God. These primary bounds have been imposed, figuratively speaking, by the Creator and Architect of the universe when He “*set His compass upon the face of the deep*” as the Book of Proverbs has so beautifully expressed it. We need not concern ourselves with the question how, based upon the primary or God-given determinations, the *modus operandi* of physics gives rise to secondary quantitative determinations, which can then be described in mathematical terms. Suffice it to say that the quantitative determinations which constitute the immediate objects of modern physics presuppose the primary cosmic bounds which determine or define the corporeal plane of existence. What then are these primary bounds? It will suffice to say that they are none other than the determinations which underlie our pre-scientific notions of *space, time*, and *matter*.

When it comes to the intermediary domain, on the other hand, these customary notions do not apply, or at least do not apply in the accustomed sense. And this entails that our scientific measures of space, time, and mass or energy—which, as we have said, presuppose the former—become inapplicable as well. By comparison to the corporeal domain, the intermediary world is thus “unobstructed” in a manner which does indeed defy our ordinary human means of comprehension, be they sensory or scientific.

We are ready now to return to the problematic of quantum theory.

“Everything we know about Nature,” writes Henry Stapp, “is in accord with the idea that the fundamental process in Nature lies outside space-time but generates events that can be located in space-time.”4 Can it be said, one is now constrained to ask, that “the fundamental process in Nature,” which proves not to be subject to

the ordinary bounds of space and time, is in fact situated on the intermediary plane? Can it be said, thus, that physics, on its most fundamental level, has in a way *rediscovered* the intermediary world? One sees that such is “in a way” the case. Not, to be sure, in the sense of a discovery or theorem that can be formulated on the level of physics itself. What physics *can* prove, and what it has indeed established beyond reasonable doubt, is that external reality —and thus the cosmos as such—cannot be confined within the bounds of Einsteinian space-time: for if it could be thus confined, it would perforce satisfy Einstein’s condition of locality, which in fact it does not obey. Inasmuch, however, as the external reality transcends the bounds of Einsteinian space-time, it escapes the grasp of contemporary physics; Nick Herbert, it turns out, has it exactly right: physicists *have* “lost their grip on reality.” It needs however to be added that they never had such a “grip” in the first place. What physics deals with in the final count, to put it in terms of our erstwhile metaphor, is not the “water,” but the “pot.”

4. “Are Superluminal Connections Necessary?” *Il Nuovo Cimento*. 40B (1977), p. 191.

But why should that recognition amount to a “rediscovery of the intermediary world,” as we have suggested? This is not of course a scientific question, but one that belongs incurably to the domain of traditional ontology. And the fact is that it does: to speak of “a process in Nature” outside of space-time as does the physicist Henry Stapp is most assuredly to situate that “process” on the intermediary plane.5 What validates the inference is simply the fact that the things of the spatio-temporal world are none other than the things of the intermediary realm *subjected to spatio-temporal bounds*: remove these bounds, and what remains pertains indeed to the intermediary plane. And I might mention in passing that the transition from the former to the latter is precisely the alchemical *solve*, even as the reverse transition constitutes the complementary *coagula*: like the reality itself, the operations of alchemy do not fit into the spatio-temporal stratum of the universe. Getting back to nonlocality:

whatever the quantum physicist himself may think, he *has* in effect rediscovered the intermediary world.

5. One must remember that “above” the intermediary domain, the notion of “process” loses all sense.

The question remains of course what the physicist does think in that regard. Now to be sure, most physicists do not “think” at all: they simply accept the quantum facts and go about their business.

One knows very well, moreover, what that business is: its object is to discover new facts of the same generic kind, and comprehend all these findings, so far as one can, within a single mathematical structure. The question of “being,” of ontology—of *Weltanschauung* properly so called—does not arise at all; only a small minority of scientists, it appears, have seriously pursued these deeper issues. They are the quantum-reality theoreticians; one should however add that though their number be small, their ranks include most of the great founders, men of the stature of Bohr and Einstein, Heisenberg, Schrödinger and Planck. I have already referred to the fact that Einstein and Bohr assumed opposing positions, and that most quantum reality theorists eventually sided with Bohr. The majority came thus to believe that the pre-quantum worldview, which most physicists had tacitly assumed, needs now to be abandoned; and so began the search for a new philosophical *Ansatz* that could account for the paradoxical findings of quantum theory. A wide variety of philosophical conceptions have since been pressed into service, including notions that are truly bizarre, such as the various kinds of “many-worlds” theories presently in vogue; yet it appears that these labors have so far succeeded only in exacerbating the philosophical confusion. It would seem that just about every conceivable remedy has been tried, with a single exception: not one of these philosopher-scientists has placed himself on traditional metaphysical ground.

What is called for, as I have argued repeatedly, are certain speculative keys which the perennial wisdom alone can supply. And these keys are in fact none other than the principles of traditional cosmology which I have enumerated summarily in the Introduction to

this book. In the preceding two chapters we have been primarily concerned with the first of these principles, which is tantamount to the tenet of non-bifurcation: it was the systematic application of this principle that led us to the ontological distinction between the physical and the corporeal domains, and has made possible the subsequent reinterpretation of physics as such. In the present chapter, which has to do with the quantum-mechanical finding of nonlocality, we have applied the second cosmological principle, which refers to the hierarchic structure of the integral cosmos. The key to the understanding of nonlocality, it turns out, is to be found in the traditional distinction between the corporeal and the intermediary levels of cosmic manifestation, and thus between the *sthula* or "gross" and the *sukshma* or "subtle" modes of being, to put it in Vedantic terms. As we have come to see, the "process in Nature" that gives rise to the observable quantum phenomena is in fact "subtle" in precisely the Vedantic sense, and is consequently situated, ontologically speaking, "above" the corporeal level. Strangely enough, quantum physics itself, when interpreted from a metaphysical point of view, distinguishes thus between *three* ontological planes: in ascending order, these are the physical, the corporeal, and the intermediary. To be precise, quantum mechanics affirms the first ontological discontinuity or hiatus through the phenomenon of state vector collapse, and the second through its recognition of nonlocality.

No wonder these two phenomena constitute the great enigmas of quantum theory! No wonder both should have mystified the physics community; for it happens that neither can be understood from the perspective of physics itself. Positioned, as he is, on the corporeal plane, the physicist is looking "downwards" at the physical.

Ontologically speaking, his perspective is thus centrifugal, which is to say that his intellectual gaze is directed *away* from the ontological center, the pole of "being" and "essence." What ultimately confronts him, thus, is the outermost periphery of the integral cosmos, what the Scholastics termed the *materia secunda* or "container" of the universe, which has no being, no essence, no existence of its own.

In this perspective he cannot see the corporeal, much less can he conceive of the intermediary realm, which is situated “above” the corporeal. To arrive at an understanding of what quantum theory itself has brought to light, he needs thus to undergo an intellectual conversion or *metanoia*: a revolution of 1800 one can say.

Meanwhile the fact remains that quantum mechanics has “in its own way” rediscovered the intermediary domain. And this event is epochal. If the modern West is indeed the first society to view the corporeal world as a closed system, as Huston Smith observed, that error has now been detected on the basis of physics itself.

Needless to say, this recognition has decisive implications not only for philosophy, but for every fundamental domain of science as well. This holds true above all in the case of evolutionary biology, a discipline which in fact it disqualifies at one stroke. In view of the enormous importance of this question I will close with a brief consideration of that issue.

What Darwin failed to grasp, and what even most of his opponents have failed to realize, is that the corporeal universe in its entirety constitutes no more than the outer shell of the integral cosmos, and that the mystery of origins needs in fact to be resolved, not at the periphery, but precisely at the very center of that integral universe. So long as one imagines that the origin of a plant or animal may be conceived as a spatio-temporal event or process of some kind, one has missed the point. Briefly stated, corporeal beings have a double birth: a pre-temporal birth, first of all, in the divine creative Act, and a temporal birth which marks their entry into the corporeal domain. Now, what the first birth brings into being is what the Latin Fathers termed the *ratio seminale* and the Greeks the *logos spermatikos*, which is not however a corporeal entity—not actually a seed in the sense of biology—but a spiritual seed, one could say. That seed, metaphorically speaking, is sown at the Center, incubates in the intermediary domain, and is brought into manifestation on the corporeal at a moment of time “when it ought to come into being” as St. Augustine declares. Such is the authentic evolution as

recognized in Patristic tradition, which constitutes not the creation of something new, but indeed an “unfolding,” as the very term implies, of something which already exists. At a certain moment, “when it ought to come into being,” that organism breaks through, as it were, into space-time and thus becomes perceptible; and this “breaking through” constitutes its second birth, its birth in the ordinary sense.6

6. For a summary of this Patristic doctrine I refer to pp. 20–25 in my book, *Theistic Evolution: The Teilhardian Heresy* (Tacoma, WA: Angelico Press/Sophia Perennis, 2012). Extensive documentation may be found in Fr. Seraphim Rose’s monumental treatise, *Genesis, Creation and Early Man* (Platina, CA: St. Herman of Alaska Brotherhood, 1999).

It is to be noted that this conception of a “double birth” is in fact biblical. It is briefly but yet unequivocally stated in Chapter 2 of Genesis, verses 4 and 5, which deviate abruptly from the perspective of the hexaemeron, as described in Chapter 1. In that remarkable passage, which seems to have been rarely understood, the first birth is relegated to “*the day when the Lord God made the heaven and the earth*,” whereas the second is depicted as an emergence the space “above ground,” as of a plant springing up in the earth. The more deeply one probes these two crucial verses, the more clearly one perceives that they provide the key to the mystery of biological origins.7

7. For an exegesis of the verses in question I refer to *Theistic Evolution*, op. cit., pp. 249–252.

Such, in brief, is the biblical doctrine concerning biogenesis.

Unlike “creationism” of the customary kind, it opens ontological vistas unsurmised by the opponents no less than the protagonists of Darwinism. From an authentically ontological point of vantage one sees at a glance that Darwinian transformism constitutes but a brutal attempt to explain the mystery of origins on the corporeal plane, where precisely it can *not* be resolved. We know today in light of quantum theory that not even an electron fits into that truly narrow

world—what to speak of plants and animals, and above all, of man himself.

4 Celestial Corporeality

Leiblichkeit ist das Ende der Werke Gottes

Friedrich Christoph Oetinger

Having reflected at length upon nature of the corporeal plane and touched upon the intermediary, it behooves us now to consider the third and highest cosmic domain, which is the spiritual or celestial, as it is also called. I propose, moreover, to view that ontological domain in its lowest aspect or modality, which may appropriately be termed *celestial corporeality*.

As is well known, Christianity believes not only in the immortality of the human soul, but also in what it terms the resurrection of the body. Somehow the bodies of the deceased will be "raised," and in the process, transformed and glorified. "*Behold*," St. Paul declares, "*I show you a mystery: We shall not all sleep, but we shall all be changed. In a moment, in the twinkling of an eye, at the last trump: for the trumpet shall sound, and the dead shall be raised incorruptible, and we shall be changed. For this corruption must put on incorruption, and this mortal must put on immortality*."1

1. 1 Cor. 15:51–53.

Whatever may be the position of other religions in that regard, Christianity does not place before us the prospect of a discarnate posthumous state: "*For we that are in this tabernacle do groan, being burdened: not for that we would be unclothed, but clothed upon, that mortality might be swallowed up of life*."2

2. 2 Cor. 5:4.

This miracle, this unthinkable prodigy, the Christian maintains, has already come to pass in the resurrection of Christ, "*the firstborn from the dead*."3 The dogma of bodily resurrection, moreover, is absolutely crucial to Christianity: "*If there is no resurrection of the dead,"* St. Paul affirms, *"then Christ is not risen. . . . And if Christ be not raised, your faith is vain*."4

3. Col. 1:18.

4. 1 Cor. 15:13, 17.

Admittedly that teaching has always been "hard," and offensive to the philosophers. It is easy enough to imagine or to conceive of a discarnate state; but the raising of dead bodies—that is something else. No wonder the learned men of Athens shook their heads in disbelief. "*And when they heard of the resurrection of the dead*," we are told, "*some mocked: and others said, We will hear thee again on this matter. So Paul departed from among them*."5 Nor did the skepticism and disdain of the intellectuals abate with the spreading of the faith. One is reminded of the Platonist Celsus who so eloquently berated Christianity: "a religion befitting an earthworm" he called it. What is new, in our day, is that theologians professing to be Catholic have joined the skeptics, and have felt obliged to expunge the offending dogma by one means or another. In so doing, however, they have contradicted the explicit and indeed *de fide* teaching of the Catholic Church, and have in fact struck at the very heart of Christianity. Once again: "*If there is no resurrection of the dead, then Christ is not risen. . . . And if Christ be not raised, your faith is vain*."

5. Acts 17:32, 33.

For the Christian, thus, the stark spectacle of the "empty tomb" is not negotiable. It cannot, as some contemporary *periti* would have us believe, be written off as a literary device intended to bring home the idea of immortality to unphilosophic minds. Christianity maintains, on the contrary, that the "empty tomb" testifies to the greatest miracle ever witnessed on earth: the bodily resurrection of Jesus.

Christians believe, moreover, that a similar resurrection will take place universally “at the end of time,” when Christ will come again:

“*in the clouds of heaven, with power and great glory*.”6

6. Matt. 24:30.

Now, the pressing problem for theology—and indeed for metaphysics— is to elucidate the dogma of bodily resurrection, to render it somehow conceivable. What Christ and His Church have taught concerning the nature of God, or of the human soul, is by comparison far less difficult it would seem, far less problematic to the human intellect. The hardest dogmas, it appears, are those that hinge upon the notion of *body*, the idea of “flesh and blood” if you will, transposed into the spiritual realm. Think of the well-nigh unbelievable words of Christ when He taught in the synagogue at Capernaum: “*Verily, verily, I say unto you, Except ye eat the flesh of the Son of man, and drink his blood, ye have no life in you*.”7 The Jews moreover understood well enough that this was more than a mere figure of speech, a mere metaphor: “*Many therefore of his disciples, when they heard this, said, This is an hard saying; who can hear it?* ”

7. John 6:53.

Meanwhile the Catholic Church continues to insist that the *flesh* and *blood* in question are to be taken literally—with the understanding, of course, that these terms refer precisely to the risen and glorified body of Christ. It is this glorified or “celestial” body that is offered as food in the sacrament of the Eucharist. But let us not forget that the host, when consecrated, does not disappear; it is not simply replaced by the body of Christ, but is transfigured into that body: it is “transubstantiated” to use the official term. What takes place, thus, upon every Catholic altar is akin to the Resurrection: it is one and the same Christic miracle that presents itself in two modes.

The mystery of celestial corporeality and its attainment—be it in the Resurrection or in the Mass—has of course been speculated upon

by theologians since apostolic times. Yet it appears that some sixteen centuries into the debate a Christian layman—a cobbler and peddler of clothing, no less—was able to contribute decisive insights, which perhaps to this day have been insufficiently reflected upon. I am referring of course to Jacob Boehme, whose teachings can be viewed as inaugurating a new school of theological speculation. In the present chapter I propose, first of all, to give a brief overview of Christian thought as it bears upon the nature of celestial corporeality, from its apostolic beginnings up to the end of the sixteenth century. These historical observations, moreover, are based upon a paper by Julius Hamberger, which appeared in the *Jahrbuch für Deutsche Theologie* in 1862.8 I might add that Hamberger was a disciple of Franz von Baader, the renowned Catholic exponent of Boehme's thought, and was himself a profound thinker who deserves to be far better known than has so far been the case.

Having completed the aforesaid historical overview I propose to present the relevant conceptions of Jacob Boehme, following closely the interpretation of Pierre Deghaye.9 What I hope to convey is the fact that Boehme's doctrine enables us to view the subject of "*himmlische Leiblichkeit*" in a distinctly new light. Following this, I propose to reflect further upon the nature of celestial corporeality, in an effort to distinguish the celestial as clearly as possible from the kind of corporeality known to us here below. The final section will focus upon "time and eternity," and it is here that the preceding considerations prove pivotal.

Hamberger begins his historical essay with a summary consideration of "*himmlische Leiblichkeit*" as conceived in various pre-Christian traditions. However, considering the extreme difficulty of penetrating, *par distance* and from the outside, teachings such as those of ancient Egypt or of Kashmiri Tantrism, let us say, it may be best to leave out of account the opinions of the German savant regarding such domains. The case is different when it comes to the teachings of Plato and Aristotle, not only because they stand at the beginning of what may be termed the philosophic mode, but also because both have exercised a profound and indeed decisive influence upon the

development of Christian thought. It will therefore be appropriate to begin our recapitulation of Hamberger's essay at that point.

He contends, first of all, that the doctrines of both Plato and 8. "Andeutungen zur Geschichte und Kritik des Begriffes der himmlischen Leiblichkeit," vol. 7, pp.107–165. I am indebted to Professor Roland Pietsch of the Maximilian University at Munich for bringing this material to my attention.

9. One of the foremost authorities in this field, Deghaye has provided what may well be the finest commentary on the thought of the German mystic. See especially *La Naissance de Dieu ou la Doctrine de Jacob Boehme* (Paris: Albin Michel, 1985).

Aristotle— each in its own way—rigorously exclude what he deems to be the authentic Christian conception of celestial corporeality.

"Plato no less than Aristotle," he writes, "despite the fact that they recognized a supreme unity, transcending every opposition, as the source of all being, remained nonetheless confined within a dualism of the ideal and the real, of spirit and matter." In either philosophy a permanent and perfect union of spirit and matter, of soul and body, Hamberger believes, is unthinkable. One is forced to conclude in either case that the opposition between the real and the ideal, the sensible and the intelligible, is transcended nowhere save in the supra-ontological sphere of the Absolute. An elevation of the material to the spiritual plane is unthinkable; St. Paul was right: that Christian tenet *is* "foolishness to the Greeks."

The earliest indications, in Judaic tradition, bearing upon celestial corporeality are found in the accounts of Enoch and of the prophet Elijah. What we are told in the case of Enoch is exceedingly sparse: when he was three hundred and sixty-five years old, we read in Genesis 5, "Enoch walked with God; and he *was* not; for God took him." Having lived an exceptionally pious and virtuous life, "God took him," and he was seen no more. As Hamberger observes:

“The body of this patriarch, one may gather, was delivered from earthly existence by being swallowed up, as it were, by the life of the spirit, or better said, taken up into that life and thus brought to transfiguration.” A similar event is recounted in the case of Elijah: one day, as the prophet was walking with Elisha, his son, “it came to pass, as they still went on, and talked, that, behold, there appeared a chariot of fire, and horses of fire, and parted them both asunder; and Elijah went up by a whirlwind into heaven.” (II Kings 2:11) The graphic and explicit nature of this account suggests that it may refer to an actual experience of a visual kind; and yet, as Hamberger points out: “No pious Israelite could have doubted that, behind what the bodily senses could perceive, an event has taken place that extends into the realm of the invisible, the transformation, namely, of the material corporeality of the prophet into the supra-material, even if that Israelite was unable to understand clearly the essential difference between the two.”

The definitive texts, however, on the question of *himmlische*

Leiblichkeit are evidently those of the New Testament relating to the resurrection of Christ. It is here, in this unique and epochal event, that celestial corporeality enters, as it were, into our world: enters upon the stage of history, one might say. What happened on that first Easter Sunday is indeed, in a sense, historical; speaking of the risen Christ, St. Paul assures us that “*he was seen of above five hundred brethren at once*.” It is easy, however, to misinterpret the biblically attested facts, and thereby miss the very point of the Resurrection. One needs to realize that this ostensibly historical event marks nonetheless a radical break with the earthly condition:

“From that moment on,” Hamberger observes, “the Savior belongs no longer to the earthly realm, but to a higher sphere, from whence he reveals himself to his disciples only in sporadic appearances, as if by visitation.” The Savior, one may presume, revealed himself to his yet earth-bound disciples in visible and tangible form to convey to them the fact that he has indeed risen from the dead; and yet, when he appeared suddenly behind locked doors or ascended

miraculously, he likewise demonstrated that his spirit had now attained total dominion over his corporeal nature. “Thus his corporeality,” writes Hamberger, “was now evidently supra-material and no longer subject to the bounds of time and space.”

All the same, many among the followers of Christ have conceived of his transfigured corporeality in basically material terms, suitably “thinned or sublimated” as Hamberger notes. This widespread and indeed dominant tendency has moreover been complemented by an opposing trend, epitomized by the rigorous spiritualism enunciated by Origen. As Hamberger explains: “The reason for the spiritualistic course which Origen pursued lay no doubt in his concern to purify the conception of spirit from the contamination of every material admixture, which however seemed to him to necessitate the exclusion of all corporeality, because, with Plato, he regarded the perfect reconciliation of spirit and nature, the complete elevation of the second to the first, as impossible. But inasmuch as this spiritualism proved to be incompatible with the true sense of Scripture, there arose against him determined opponents, who sought with great emphasis to defend the biblical realism, yet could not do justice to the biblical truth.”

The foremost among these “determined opponents” was no doubt St. Jerome, who championed what might nowadays be termed the fundamentalist position. True flesh, for him, was only “what consists of blood, veins, bones, nerves and the like; also teeth, stomach, and genitals could not be absent in the celestial state.” It may however come as a surprise that even St. Augustine, Christian Platonist though he may have been, should have held similar views on the subject, “yet in a more delicate form” as Hamberger observes.

The reason, however, for this apparent incongruity, is not far to seek: “Without doubt, Augustine was entirely right when he refused to view the transfiguration of the body as its cancellation or disappearance; the true character, however, of the transfigured body, which consists in a perfect harmony and concord of nature with spirit, of the real and the ideal, he failed to recognize. Against the former error he was protected by his faithful adherence to the word of Scripture; the latter recognition, on the other hand, may have eluded him on account of his predilection for Platonic philosophy.”

Be that as it may, it does appear that Christian speculation regarding celestial corporeality has tended to vacillate somewhat between two extremes: the fundamentalist and the spiritualistic, one might say. But as Hamberger points out: “Besides such erroneous deviations to one side or the other, there have never been lacking in the Church teachers who knew how to hold fast to the biblical sense of celestial corporeality, and employ that conception in the unfolding of systematic theology.” An excellent example would be Tertullian. That this Patristic author was far removed from the spiritualistic camp of Origen is obvious, given his famous statement:

“Who will deny that God is a body, even though He is a spirit.” Yet the very boldness of this assertion makes it clear that Tertullian is also worlds removed from the fundamentalism of St. Jerome.

“Nothing was further from Tertullian’s mind,” writes Hamberger, “when he ascribed corporeality to God, than to conceive of that corporeality after the fashion of our earthly body.” And it is of interest to note that St. Augustine, while finding it hard to penetrate Tertullian’s language, regarded him nonetheless as basically orthodox.

Tertullian “did not wish to depart,” Hamberger writes, “from what the Bible itself suggests quite clearly concerning the corporeality of God, and also recognized well enough the truth that all reality must be somehow *formed*, and that, in the absence of some kind of corporeality, the spirit could not function as such.” For Tertullian spirit

and body are correlatives: the one demands the other. “All invisible things,” he writes, “have for God their body and their form by which they are visible to Him.” As Hamberger observes: “One sees clearly that Tertullian was permeated by the thought of supra-material corporeality.” It is likewise evident, however, that this predilection for supra-material corporeality has never been shared by the vast majority of theologians.

Yet it happens that the Christological teachings enunciated, two centuries later, at the Council of Chalcedon are in fact concordant with Tertullian’s idea of supra-material embodiment. Hamberger has it exactly right: “When namely it is ascertained at Chalcedon that one cannot, on the one hand, regard the human nature of Christ as having been absorbed by the divine, but neither can one regard it as existing in opposition to the divine, or even, as it were, side by side, but must instead assume that the human nature is entirely permeated by the divine and received into the same, it follows that something similar must then apply in general to celestial corporeality in relation to the life of the spirit. In consequence of the aforesaid conciliar decision, one is not permitted to think that in this elevated state the flesh has disappeared, as if absorbed by the spirit; but neither may one conceive of the transfigured flesh in material terms.” It appears, however, that the teaching of Chalcedon was generally viewed exclusively in its Christological aspect, and that its implications regarding celestial corporeality as such have generally been ignored. Thus St. John Damascene, to cite just one example, does not hesitate to speak of “deification” with reference to the glorified flesh of Christ, but continues all the same to conceive of the celestial bodies of angels and of saints as inherently material entities.

To be sure, there have also been theologians who did perceive the wider implications of the Chalcedonian position. This holds true, above all, in the case of John Scotus Eriugena, for whom the idea of celestial corporeality occupies a position of central dominance.

As Hamberger observes in that regard: “Not only does this very conception appear in its highest purity, but also in such a universal manner as to pervade the entire doctrinal system of this great thinker and render possible an authentically scientific understanding of Christian truth in its main elements.” What John Scotus explicates with utmost clarity and emphasis is the supra-materiality of the first creation: “God is immortal,” he declares, “and what He alone creates, that is likewise immortal.” In keeping with this idea, he conceives of the original state of man in distinctly celestial terms.

He does not hesitate, in fact, to apply the dogmatic formulas of Chalcedon to mankind, and indeed, to the universe at large, in their state of perfection. His doctrine, as it applies to the perfected universe, constitutes in effect a Chalcedonian cosmology. John Scotus is able to conceive of a universal transfiguration precisely because he views the matter of our world, not as something absolutely primordial, but as itself derived from an immaterial principle. “There is nothing in human nature,” he declares, “that is not spiritual and intelligible; even the substance of the body is intelligible.” Materiality makes its appearance only where spirit or will stand in opposition to the archetypal idea, that is to say, only where “sin” has entered. “It is unthinkable,” says John Scotus, “that the body was perishable and material before the cause of death and materiality, namely sin, had appeared.” This position, however, has eschatological implications; as Hamberger points out: “The re-elevation to supra-materiality becomes thus possible through the conquest of sin, and the way is thereby opened for a return of the world to God, to the end that God may become all in all.”

John Scotus conceives the supra-material state to be supra-spatial and supra-temporal as well. As surely as God Himself is above time and space, he maintains, it is certain that, with the elevation of the presently material world, “time, as the measure of motion, will disappear, and so too space, as the separator of things, shall be no more.” Both space and time are aberrant, moreover, precisely because, in the celestial order, there *are no* separations of that kind.

“There is nothing incredible or irrational,” writes John Scotus, “in the supposition that intelligible beings unite, so that they are one, while each retains its own characteristics, but in such a way that the lower is contained in the higher.” To help us understand, he gives the example of air permeated by the light of the Sun, which though it pervades the air yet retains its own substance. “Likewise, I believe, will the corporeal substance go over into the soul, not to perish, but that, having been elevated to a more excellent condition, it shall be preserved. So too one must suppose that the soul, having been received into the intellect, becomes more beautiful and more similar to God. In the same way I think of the entry into God— not perhaps of all, but certainly of rational substances—in whom they shall reach their goal, and in whom they shall all become one.”

This grand and majestic vision of God, man, and universe, however, seems never to have been shared by many—not, in any case, where corporeal nature is concerned. In Hamberger’s words: “As little as Tertullian was able to gain for his profound spiritual intuitions a wide recognition, so too John Scotus would not be able to convey his sublime worldview to his own and future generations as their common heritage.” Whatever the reasons for this resistance or neglect may be, John Scotus’ lofty conception of celestial corporeality has apparently had little impact upon the subsequent course of mainstream theological speculation.

The case of Albertus Magnus and his illustrious disciple is of course of special interest. Now, it does appear that Albertus may have been open to John Scotus’ idea of celestial corporeality, although it remains unclear whether he was in any way influenced by the Irish theologian. It seems more likely that Albertus derived inspiration from Avicebron, whose writings he studied assiduously, and whose thought was in certain respects kindred to the teachings of John Scotus. As Hamberger explains: “Avicebron namely was sharply opposed to the usual assumption that substance composed of matter and form must always and everywhere be thought of as something material. The concept of the material, he taught, rests upon the notion of quantity, whereas substance need not entail

quantity, but may well be conceived without quantity, and hence without materiality, while still composed of matter and form." But whereas this position—which apparently Albertus did not oppose—permits the conception of a supra-material corporeality, the German master seems not to have fully availed himself of this option. According to Hamberger, Albertus Magnus attained to the true concept of *himmlische Leiblichkeit* "only in the case of the God-man, and only with difficulty can his utterances concerning the bodies of the risen saints be reconciled with the idea of an actual transfiguration." When it comes to St. Thomas, moreover, Hamberger thinks that on this issue Aquinas reverted more or less to the position of Jerome and Augustine. In support of this contention he points out, for example, that the blessed, according to the teaching of St. Thomas, "shall appear at their resurrection in the age of their youth, namely, in that period of life which stands midway between growth and decline"—a view which admittedly is worlds removed from the thought of John Scotus. Hamberger maintains, however, that this "insufficient, and indeed erroneous conception of the resurrected body" is to be ascribed, not to any deficiency on the part of St. Thomas himself, but to external constraint: "It was not an inner, but an outer fetter that impeded the flight of his thoughts." In any case, the fact remains that the theological direction championed by Tertullian and John Scotus did not flourish—for whatever reason — within the bounds of the official Roman Catholic Church. The further development of this theological direction is rather to be found near the periphery, so to speak, in the aftermath of the Reformation, and chiefly in Protestant lands. One must look for it, not among theologians of ecclesiastic rank, but in the circles of mystics, physicians, and God-fearing philosophers. It was moreover in the teachings of our pious and lowly cobbler that this movement, if we may call it such, reached what appears to be its fullest expression, and possibly its consummate form.

German theosophy did not originate abruptly with Jacob Boehme: the movement has earlier representatives, the most illustrious being Paracelsus (1493–1541) and Valentin Weigel (1533–1588). Even so, Boehme's thought displays the originality and titanic force of a

revelation; and as is typically the case with a legacy of this kind, his teaching proves to be *de facto* inexhaustible. After centuries of analysis and commentary the fascination of this enigmatic figure remains undiminished. Today, in fact, standing at a greater distance, we can all the better perceive the seminal potency of his thought.

Many literary strands and esoteric traditions have met and mingled in Boehme's system; but in the process they have become radically transformed: what emerges is a coherent teaching bearing the distinctive signature of the *philosophus teutonicus*. At his hands our perceptions of God, man, and the universe—while remaining rigorously Christian and indeed biblical!—have been profoundly altered and ostensibly enlarged in certain respects. If St. Thomas Aquinas has enriched Christianity by "christianizing" the wisdom of Aristotle, it can indeed be said that Jacob Boehme has done likewise with reference to the Hermetic tradition. In his opus a profound and long-forgotten "alchemical" philosophy of nature reveals its contours, but in a new context, a brand new key; as Pierre Deghaye explains: "Transposing philosophy of nature to the level of a supreme knowledge proper to theology, Boehme made of it a *theosophy*."10 And he goes on to say: "In fact it is also a theology, that is, a science of God. But it is profoundly different from dogmatic theology, not only Lutheran,11 but of any confession whatever. Theosophy represents another approach to God. . . ."

The genre itself did not originate with Boehme; for as Deghaye points out, Jewish Kabbalah and Islamic mysticism are likewise theosophies. "What these three types of thought have in common," he writes, "is that their subject matter is God making Himself known." Boehme, in particular, distinguishes clearly between God as Absolute—what he signifies by the term *Ungrund*— and God as He is revealed, not only to humanity, but first of all, to Himself.

There can be no science, he maintains, no knowledge of any kind, of

10. Our quotations are taken from "Jacob Boehme and his Followers," *Modern Esoteric Spirituality*, Antoine Faivre and Jacob Needleman, eds. (New York: Cross-road, 1995).

11. Though born in Lutheran territory and nominally Lutheran, Boehme was in fact persecuted by the Lutherans, to the point that he could not have even be given Christian burial if it had not been for the intervention of an influential friend. But whereas Boehme's doctrine is indeed at odds with Luther's ideas, it is by no means antagonistic to Catholic theology. Allowing for the fact that theosophy and dogmatic theology represent different points of view, it can be argued that Boehme stands yet within the integral Catholic tradition, which is in fact *katholikos.* the *Ungrund* as such: only the self-manifesting God can be the object of knowledge, and indeed, of love. Basing himself, one has reason to believe, upon a mystical experience, Boehme envisages a process of self-revelation *in divinis* which, theosophically speaking, "gives birth to God." It is this "eternal birth," moreover, that constitutes the primary theme of Boehme's theosophy. Supra-temporal though it be, Boehme conceives of that "birth" in terms of a sevenfold cycle, which in fact constitutes the archetype of time. As Deghaye observes, it represents "the week of creation transposed to the level of an utterly first origin." Speaking in temporal terms, the cycle can be described as a conquest, in successive stages, of a primordial darkness or chaos, which Boehme also refers to as a dark fire. "Dogmatic theologies," Deghaye points out, "speak first of the light that is synonymous with divine perfection. They mention darkness only in reference to the angel precipitated into it. Boehme puts darkness first. The first part of the seven-part cycle of divine manifestation is dark. In order for light to pour forth, it must shatter the darkness." God's birth constitutes thus a Victory, a supreme Heroic Act which in fact prefigures the Death and Resurrection of Christ. Strange as it sounds, it can indeed be said that "Boehme's God dies before he is born." The defining event of Christianity comes thus to be viewed in a strikingly new perspective: "What transpires on earth once Christ has come among us," writes Deghaye, "only objectivizes for us the primordial event that unfolds in the seven-part cycle."

Now God is revealed, is rendered visible, in His glory, which is a radiant body, a body made of celestial light. We must not however think of the revealed God as existing simply by Himself, "in splendid

isolation"; as Deghaye explains: "In order to contemplate himself, God requires that a mirror be offered to him in a form he has raised up, which, although inhabited by him, is distinct from him. . . . The mirror is the body of the angels. The revealed God appears the moment angels are there to contemplate him." One sees that the birth of God is accompanied by the genesis of His eternal abode, which is the primordial heaven, the celestial realm. Boehme's doctrine, thus, is not only a theogony, but a cosmogony as well. It constitutes in fact a triple cosmogony, which is to say that Boehme envisages the genesis of *three* worlds, corresponding to what he terms the three principles. The highest of these is the primordial heaven, which is "a world of light." But this celestial realm, Boehme maintains, is brought into being by way of a sevenfold cycle that begins in darkness: a darkness which, strange to say, already prefigures Hell. It is the fall of Lucifer that objectivizes this primordial darkness, and in so doing, gives birth to the infernal realm. Thus, in wanting to be "like unto God," Lucifer has inverted the very process that founds the angelic domain: instead of light "shattering the darkness," it was now the darkness that shattered the light of his angelic nature; and so "a world of darkness" came to be.

Our world, finally, is the third; it is preceded by the creation of Adam and precipitated by his Fall. A temporary world according to theosophy, its *raison d'être* is to permit the reconciliation of a fallen humanity with God. By its very nature it constitutes an intermediary realm in which Light and Darkness—the heavenly and the infernal principles—are mingled. Boehme refers to it as the third principle. One might add that this intermediary status, which theosophy ascribes to our world, is indeed borne out by its phenomenology; for as we all know well enough, ours is a world of combat, of ceaseless strife impelled by the clash of opposing forces.

What proves to be of major interest in Boehme's theosophy is the relation of our world to the heavenly, the primordial, which is its archetype. "The first nature," writes Deghaye, "engenders the other nature, our own, which obscures it while at the same time manifesting it sufficiently to reflect it. This second nature will be

destroyed [at the end of time] and the primordial nature unveiled, manifesting God in all his Glory." Despite the dissimilarity of the two —which in fact puts the first beyond even our imaginative reach

Eternal nature remains within the envelope of our nature . . . and yet there cannot be the least confusion between the two." The distinction, however, between "inner kernel" and "outer shell"—the 12. I am leaving out of account what Henri Corbin refers to as the active imagination, which constitutes an inherently spiritual faculty.

12—the connection between them is exceedingly close; as Deghaye has put it:

"These two degrees appear successively, but the two natures coexist.

[?] fact that there is not the least confusion between the two—must not be misconstrued as an ordinary separation; one must not forget that "the two natures coexist," and that the second in fact depends upon the first. The "inner kernel," thus, so far from constituting a kind of foreign body, is to be conceived rather as the "kernel of reality," of which the "shell" is but the outer manifestation.

It is becoming apparent that Boehme's doctrine is intimately related to the alchemical quest, and presumably validates whatever truths that age-old tradition may enshrine.13 One is tempted to surmise, moreover, that Boehme's conception of a primordial and exemplary cycle may indeed harbor the rudiments of a universal science, applicable in principle to every natural domain; and it is not without interest to note that at least one contemporary scientist has drawn inspiration from Boehme's writings in the pursuit of his own discipline, which is that of particle physics.14 What the Master himself has his eye upon, however, is indeed nothing less than the salvation of man, what he terms our second birth. That is the one and only "alchemical transformation" the German mystic pursues relentlessly; and he does so as a believing and pious Christian. "Our second birth," writes Deghaye by way of commentary, "is the equivalent of the resurrection of Christ, and is anticipated in the cycle

of primordial nature. What takes place in this exemplary transformation at the threshold of time is already a death and a resurrection.

13. Whereas the educated public at large remains no doubt skeptical, if not indeed disdainful of alchemy, there is today a growing awareness among the better informed that what stands behind many an “exploded superstition” may in fact be a long-forgotten truth. Take the case of the so-called four elements: earth, water, air and fire. One can be reasonably certain that these terms were not employed alchemically in their ordinary sense, but were used to designate *elements*, precisely, out of which corporeal substances are formed. Somewhat like the quarks of modern physics, these elements are not found in isolation, but occur in their perceptible combinations. Now, given the fact that corporeal substances are not in truth “made of quantum particles” (as I have argued repeatedly, beginning with *The Quantum Enigma,* op. cit.), it is by no means unreasonable to suppose that there may indeed be such alchemical elements. It turns out that our habitual opposition to alchemy is based mainly upon a reductionist prejudice, for which there is in reality no scientific support at all.

14. Basarab Nicolescu, *Science, Meaning, and Evolution: The Cosmology of Jacob Boehme* (New York: Parabola Books, 1991). See also my review in *Sophia*, vol. 3, no. 1 (1997), pp. 172–179.

The cycle of origins is simply repeated each time life blossoms forth following transformation. All life is born only to die and be born a second time. The theosophy of Boehme is a theology of the second birth. This is what connects it with Christian mysticism, in which the focal subject is the birth of Christ in us.”

Now, all birth is an embodiment, an incarnation, a certain union of spirit with flesh. Not all flesh, however, is of the same kind. St. Paul speaks of this clearly in the fifteenth chapter of First Corinthians, in the celebrated discourse in which he distinguishes between corruptible and incorruptible bodies, the earthly and the heavenly. Our first body is of the earth, earthly; our second shall be celestial,

heavenly (*ex ouranou*). If Boehme's doctrine, therefore, is indeed a "theology of the second birth," it is also, and by the same token, a theology of celestial corporeality. There is in fact reason to surmise that the concept of *himmlische Leiblichkeit* comes into its own in the theosophy of Jacob Boehme.

All bodies, to be sure—be they ever so celestial!—are made of a substance of some kind; and when it comes to celestial bodies, that substance, as one would expect, is indeed the most precious, the most refined, the most excellent of all. "The eternal heaven," writes Deghaye, "of which the bodies of angels are made, is the precious material that develops over the course of a seven-part cycle described as the divine masterpiece." It is best conceived as a pure radiance, a celestial light, of which what we know as light here below is but a pale reflection. This celestial light, moreover, is none other than God's glory, the very radiance that constitutes what theosophy terms "the body of God." That "Body," therefore, no less than the bodies of angels and of the saints in heaven, is composed of the same "precious material" born of Primordial Nature's dark and fiery womb: "Light is its substance, its flesh" as Deghaye declares.

We are now, finally, in a position to appreciate the words of Friedrich Christoph Oetinger which I have placed at the head of this chapter: "Corporeality is the end of the works of God." The consummation of God's work of creation is indeed *embodiment*: a union of spirit and flesh, in which the two become as one. It is that perfect submission, that complete "transparence" to the indwelling spirit, that is realized in celestial corporeality. As Deghaye profoundly observes: "The only true perfection is that which is incarnated in a body of light."

"The first nature," it has been said, "engenders the other nature, our own, which obscures the former while at the same time manifesting that first nature sufficiently so as to reflect it." That obscuration, however, is such that we are unable—even in our wildest flights of imagination!—to picture, or somehow present to ourselves, that radiant and eternal nature which underlies our own. The two natures —the two worlds!—actually coexist, which is to say that the first

penetrates the second, not spatially, to be sure, but ontologically. In a word, it lies "within," as Christ Himself testifies: "*Neither shall they say, Lo here! or lo there! for, behold, the kingdom of God is within you*."15 That *regnum* or kingdom, moreover, proves to be none other, theosophically speaking, than the first and celestial nature which lies concealed here below, not only in our human flesh, but indeed in all things. Truly: "*The light shineth in darkness, and the darkness comprehended it not*."16 Boehme may indeed have been the first to penetrate the cosmological implications of this Johannine dictum, which in fact epitomizes his own conception of our world as the so-called "third principle."

15. Luke 17:21.

16. John 1:5.

Despite its ontological proximity, thus, celestial nature remains for us literally shrouded in darkness. Yet we incline to picture celestial realities in basically earthly terms: even the most eminent theologians, as we have had occasion to observe, have often enough, apparently, succumbed to this human-all-too-human tendency. To do so, however, is not only to falsify, but in a sense to invert the truth; as Hamberger explains:

It would be totally wrong (*völlig verkehrt*), when conceiving of celestial corporeality, to retain in some way the idea of earthly materiality, in order not to forfeit the nature of corporeality itself.

Be it that one imagines that higher corporeality as a perfected earthly substance, elevated to the highest, noblest form, or that one thinks of it as drastically rarefied—neither in the one nor in the other case would one have reached the true conception. The celestial stands simply above the earthly, and every imperfection to which the earthly remains subject, even when sublimated to the highest degree, must be altogether excluded from the celestial.

Every earthly admixture, even the faintest breath, that stems from this nether world, would contaminate the thought of celestial nature,

and indeed, would straightway cancel the same.17

17. Our quotations from Julius Hamberger in this section are taken from a second paper, likewise published in *Jahrbuch für Deutsche Theologie.* It is entitled “Die Rationalität des Begriffes der himmlischen Leiblichkeit,” and appears in Vol. 8 (1863), pp.433–476. After contributing three major articles on *himmlische Leiblichkeit* to the *Jahrbuch* between 1862 and 1867, Hamberger published this material in book form, under the title *Physica Sacra, oder der Begriff der himmlischen Leiblichkeit und die aus ihm sich ergebenden Aufschlüsse über die Geheimnisse des Christen-thums.* The book appeared in Stuttgart, in 1869.

In the terrestrial domain corporeal entities “occupy space,” which is to say, admit extension; we need thus to ask ourselves whether the same applies in the celestial world. Now, it is clear from the start that “celestial space”—if indeed there be such a thing—does not simply coincide with the space we know by way of sense perception.

Celestial bodies are not situated, properly speaking, in *our* space:

“*Neither shall they say, Lo here! or, lo there! for behold, the kingdom of God is within you.* ”18

18. Luke 17:21.

But by the same token one cannot say, of a celestial entity, that it is *not* here, or *not* there; for this too would, in a way, subject the being in question to the conditions of terrestrial space. So too, when one speaks of the celestial realm as residing “within,” it needs evidently to be understood that this too is not meant in a literal, that is to say, a *spatial* sense. But whereas celestial bodies remain thus aloof from any and all spatial conditions pertaining to *our* world, it cannot be denied that there must be something in the celestial realm that corresponds to the idea of space, and in fact constitutes its archetype.

On this vital question Julius Hamberger has something exceedingly important to contribute. Here is what he writes:

Not infrequently one is reluctant to attribute extension to celestial formations for fear of degrading them thereby to the level of materiality. Admittedly, an extension such as one finds in earthly things cannot apply to them; however, what is in no sense extended could have no being, no reality at all. Even spirit must have a certain extension; one must not let it be shrunk into a narrow confine, or better said, into the nothingness of a mathematical point, if it is actually to exist. When however earthly formations, on account of the prevailing obstructions affecting their life, move apart into the breadth of terrestrial space, the same cannot apply to the fully vital beings of the celestial realm. Since these admit of no inner separation, their extension must indeed be of an intensive kind, which is to say that they do not extend outwards, but inwards, not in breadth, but in depth; and this depth stands as much above that breadth as eternity looms above time.19

19. As another Boehme friend observed: “In eternity one thing does not stand outside another, as in our relation of material space, but the one thing is in the other, and yet is different from it.” (H.L. Martensen, *Jakob Boehme: His Life and Teaching,* London, 1885, p. 74). The affinity in all this to the conceptions of John Scotus Eriugena is very much in evidence.

The notion of an “intensive extension” is of course far from clear; and yet it is highly suggestive. One begins to sense that there *must* in fact be a state answering to a conception of this kind. The idea is moreover reminiscent of the “inner space,” the “space within the lotus of the heart” described in the *Chandogya Upanishad*, which is said to contain “both heaven and earth, both fire and air, both the Sun and the Moon, lightning and the stars.” In short, all things whatsoever are to be found in that inner space, which from our mundane point of view has no extension at all. They are, however, to be found in that interior space, not in their outward manifestation, but in their innermost being, precisely, which coincides, as we have seen

earlier, with their celestial archetype. The “space within the lotus of the heart” can thus in truth be none other than celestial space, and if it contains all things, it is by virtue of the fact that all things are indeed celestial at their core.

One sees that the inner space is by no means like the outer; and if indeed that external space constitutes an image of the celestial, Hamberger’s notion of intensive extension suggests that the image is actually *inverted*. There is not only an analogy, therefore, but an opposition as well between the two; and it therefore requires a radical reorientation—an authentic *metanoia* in the ancient sense—on the part of the percipient to pass from one kind of spatial perception to the other. And this, to be sure, must be the reason why we find it so difficult—nay, impossible in our present state—to grasp the nature of celestial bodies; as one reads in the *Bhagavad Gita*: “In that which is night to all beings, the in-gathered man is awake; and where all beings are awake, there is night for the *muni* who sees.” No use trying to picture to oneself what “the in-gathered man”—the *samyamî*— beholds; *his* world is indeed “night” to us. The ontological fact is that spatial separation, or distance as we know it, has no place in the celestial realm, in which extension occurs “in depth.”

The external space, one can say, separates, whereas the inner unites; the former is by nature centrifugal, while the latter is centered upon God.20

20. This inversion has been strikingly portrayed by Dante in the *Divina Comedia,* in which the terrestrial and celestial realms are poetically combined into what mathematicians nowadays would term a 3-sphere. In this “model” the two realms—the celestial and the terrestrial—are viewed as the northern and southern hemispheres, respectively, of that 3-dimensional sphere, separated by the Empyrean, which constitutes the equatorial 2-sphere. See Chapter 8, pp. 169–172.

An Aristotelian definition will help us to understand this difference more clearly. Quantity, says Aristotle, is that which “admits mutually external parts.” Take the case of a line segment: not only does a

segment, when bisected, break into two mutually external pieces, but these pieces are truly parts. The point is that the whole, in this instance, is indeed the sum of its parts—and not something more, something which is therefore inherently indivisible. Similar considerations apply to number, that is to say, to discrete as opposed to extended quantity. Even the sophisticated mathematics of our day, in all of its numerous branches, stands yet under the aegis of quantity in the precise Aristotelian sense. And this is only as it should be: *mathematics is indeed the science of quantity*. Not everything, however, is quantitative. Take color, for example: red or green, obviously, does not admit of mutually external parts. Red bodies, of course, are divisible; but redness as such is not. This means, in particular, that one does *not* change the color of an object by breaking it into pieces: color comes along "for the ride" if you will, without being in any way affected by division. Color, therefore, is not a quantity, but a *quality* as we say, and thus a thing which cannot be comprehended in mathematical terms. It should be pointed out in this connection that the so-called measurement of qualities, their presumed quantification, is not in fact the measurement of a quality, but of a concomitant quantity precisely. Qualities as such cannot be measured, cannot in any way be quantified.

Now, the point to be made is simply this: The extension of celestial bodies—like the qualities here below—does *not* admit of mutually external parts; it is not divisible. The kind of extension that breaks into separated parts does not exist in the world above; in that realm, extension is intensive, as Hamberger says: it is an extension, one can say, not in "breadth," but in "depth." As we pass from our world to the celestial, what is lost is thus precisely the quantitative aspect of things. The qualities, here below, do also, no doubt, bear an earthly stamp; but even so, they derive their essence from the celestial realm. The qualities are thus like a glass through which the supernal light filters "obscurely" into our world, to use St. Paul's metaphor. The function of quantity, on the other hand, is not in fact to transmit—to convey essence—but to separate, or better said, to externalize. It is thus by virtue of their quantitative aspect that the things of earth are excluded from the inner world; it is on account of

its extension in “breadth” that the camel is unable to pass through the needle’s eye. And it is therefore the quantitative aspect of things that will be destroyed at the end of time: “*As a vesture shalt Thou fold them up, and they shall be changed*.”21

21. Heb. 1:12.

The ingredient which bestows upon the things of this world their distinctive materiality, their earthly cast, is thus none other than *quantity*: no wonder we find it hard to let go of our quantitative conceptions, as indeed we must if we are to grasp the nature of celestial corporeality! It can indeed be said that all things in this world are rooted in quantity. Like a plant emerging out of the earth, they evolve out of a quantitative substrate, a *materia quantitate signata* that underlies our universe. It is this quantitative substrate, moreover, which becomes objectified through the *modus operandi* of physics, and presents itself to the eye of the scientist as the physical universe, his world of atoms and of galaxies, as we have seen in the earlier chapters of this book. It needs to be clearly understood, however, that this physical universe, which constitutes the intentional object of physics, does not simply coincide with our world, but represents only its quantitative aspect. Physics is blind to the qualities, blind therefore to all essence. It sees only what is indeed outermost, and thus what stands at the furthest remove from the ontologic core of the integral cosmos.

But needless to say, this is not how the physicist generally conceives of his discipline. Trained and conditioned, as he is, to be reductive, i.e., to think of the real in rigorously quantitative terms, he habitually identifies the physical universe with the world at large.

And even when he turns mystical, as he occasionally does, that mysticism itself tends to be of a reductive kind: if there be no room in the scientistic ontology even for such a thing as color—as indeed there is not—what to speak, then, of celestial realities!

One sees that the concept of celestial corporeality hinges upon the notion of “intensive extension”: nothing less than this will do.22 But if

the notion of “spatial extension” needs to be thus reformulated in reference to the spiritual domain, must not the idea of “temporal duration” be likewise shifted from “extensive” to “intensive” mode?

22. I will mention in passing that it is tantamount to the concept of *intensio interna* employed by Francisco Suarez in the theology of the Eucharist.

No one will be surprised to learn that what takes the place of time in the spiritual world is *eternity* 23; yet the question remains: what then becomes of duration? We generally incline to think of eternity as an endless duration, which however proves to be contradictory, given that a duration is defined by its beginning and its end. Neither of course can eternity be conceived as a finite duration. Theologians have conceived of it as a *nunc stans* or “now that stands,” which seems, like the so-called “moment of time,” to have no duration at all. Yet a duration of some kind it must have on pain of not existing at all; for in the absence of duration, or of something that replaces it, eternity would be as fictitious as is the aforesaid “moment of time,” which in fact does not exist.

23. Strictly speaking, we should say “aeviternity.” Yet inasmuch as that distinction does not substantially affect what we have to say, one may as well leave it out of account.

We propose to show that such is indeed the case.

A duration, then, it must have; the point, however, is that this duration cannot be temporal, can no longer be “extensive.” What is called for, evidently, is a concept of “intensive duration,” the temporal counterpart of Hamberger’s “intensive extension.” Eternity too must be “without separation,” which implies that its duration cannot “fly apart” into separated moments as the temporal does. But here again our sense-based imagination fails us. The problem is that we are attempting to grasp an existence—a *life* in fact—which is no longer mortal, but angelic, if not indeed *divine*.

Let me note, in passing, that this explains why Jacob Boehme speaks of the primordial “seven-part cycle” in temporal terms, as if it were a transformation consisting of seven separate parts or phases. The point is that he does so by force of necessity; as Boehme himself explains in his first work, the *Aurora*:

If I am to render the Birth of God out of Himself comprehensible to you, I must indeed speak in a devilish manner, as if the eternal Light had been ignited in Darkness, as if God had a beginning; otherwise I cannot teach you, so that you will understand.

Perhaps an observation attributed to Mozart—which has indeed the ring of authenticity—may serve to put us on the right track. I am referring to the composer’s amazing claim that, in the first moment of artistic inspiration, an entire musical composition can present itself, unbroken, to his inner sense: it is only at a later stage that the work becomes divided into temporally successive parts, terminating finally in a succession of individual notes. These parts and these notes, therefore, must have been somehow comprehended within the original composition as perceived by the inner sense—but not as successive, not as “mutually external”! What confronts us here is evidently analogous to Hamberger’s “intensive extension,” but now transposed from the spatial to the temporal realm.

All this relates intimately to the crucial question of “life eternal,” a life which can be conceived neither as a temporal succession of states, much less as a *stasis* in which nothing transpires at all. The truth demands the negation of both alternatives; for as Boethius has expressed it so beautifully, what it entails is “the perfect possession of an interminable life *all at once.* ” What the partisans of a static present fail to realize is that the future as well as the past are mysteriously comprehended within that “now” of eternity. These two remaining “parts of time” are not simply annihilated, but brought into coincidence; as Nicholas of Cusa points out, in eternity “all temporal succession coincides in one eternal *now.* ”

Hard indeed as it is to grasp the point of such statements, one thing at least is clear: only thus—only on the basis of such a

“coincidence”—can a “perfect possession of an interminable life *all at once*” be conceived. The fact emerges moreover that life alone *can be* eternal—because eternity *is*, finally, life. The life that we know—a life that breaks up into successive periods and terminates in death—is a reduced life, a life no longer whole; to which one should add that this fatal defect arises precisely from what theology terms Original Sin: all life here below—including the subhuman—has thus been maimed. True life, on the other hand, is eternal by nature: “ever resting in its movement and ever moving in its rest, ever new and yet ever the same” as Franz von Baader magnificently says.

One sees, finally, that celestial corporeality, unlike the corporeality of material substances, does not pertain to objects as such, but belongs rather to spiritual beings, be they angelic, human, or indeed divine. What stands at issue is a corporeality expressive of eternal life, without which *there can in fact be no such life at all*. It is indeed exactly as Hamberger declares it to be: these celestial bodies “do not extend outwards, but inwards, not in breadth but in depth; and that depth stands as much above that breadth as eternity looms above time.”

5 The Extrapolated Universe

In the present chapter I propose to reflect upon the discrepancy between our so-called scientific cosmology and the Patristic teaching concerning the creation and early history of the world, a doctrine which respects the literal sense of Genesis. One can hardly conceive of two more divergent and indeed antithetical visions of the universe, which of course explains why the Patristic worldview has come to be regarded almost universally as an antiquated and untenable doctrine, at best a kind of edifying myth. As I propose to show, it turns out that the question is not quite so simple.

We need first of all to ask ourselves whether the two divergent visions—the scientific and the Christian—refer indeed to the same cosmos, the same “world”; and surprisingly, one finds that in fact

they do not. The key recognition proves once again to be the ontological distinction between the *physical* and the *corporeal* domains, with which by now we have become familiar. On the one hand there are corporeal objects: the things, namely, which can be perceived.

Let me reiterate that these corporeal entities belong indeed to the cosmos, the external world, which is to say that from the outset I reject the Cartesian premises—reject what Whitehead terms "bifurcation"—and adopt thus a realist view of sense perception.1 Having regained, by virtue of this step, the *terra firma* of the traditional philosophic schools, one sees immediately that physical science does not in fact refer directly to the corporeal world; for as we have come to see, it refers ultimately to fundamental particles and their aggregates, things which are categorically imperceptible and consequently not corporeal. These particles and their aggregates thus constitute a second ontological domain, which I designate the *physical*.

1. On this question I refer to Chapter 4 of my book, *Science and Myth,* op. cit.

It appears that, in the course of the twentieth century, science has unveiled an imperceptible and hitherto unknown stratum of cosmic reality. Never mind the fact that this remarkable discovery has been almost universally misconstrued on account of a Cartesian bias, which in effect denies the corporeal: what concerns us in the present inquiry is the fact that there are these two disparate domains—the physical and the corporeal—and that henceforth every cosmological debate shall need, *de jure*, to distinguish between these respective "worlds." Is it conceivable, then, that the *corporeal* world does in fact accord with the data of Genesis, that is to say, with the Patristic cosmology? I shall argue that this is indeed the case.

The very possibility of a mathematical physics hinges upon the fact that every corporeal object X is associated with a physical object SX from which X formally derives its *quantitative* attributes.2 One finds, moreover, that X and SX are spatio-temporally coincident, which is to

say that the “here and now” of one applies to the other as well, a principle referred to as spatio-temporal continuity. The corporeal domain, in its spatio-temporal totality, corresponds therefore to a certain subset C of the physicist’s space-time, a notion which can be made precise.3 This subset determines moreover a complementary region, which I shall refer to as the *extrapolated universe*. It is mathematically conceivable, of course, that the subset C coincides with space-time at large, which would mean that the complementary set is empty. It is however likewise conceivable that C constitutes but a speck within the space-time of physical cosmology, which would mean that almost the entire universe affirmed in contemporary astrophysics would be in fact extrapolated.

2. *The Quantum Enigma,* op. cit. See especially pp.33–36.

3. The problem is this: If P and Q are points in C and R is a point “between” P and Q, one wants R to belong to C as well. Now, in a “flat” space-time, one can define C to be simply the smallest convex subset containing all corporeal objects. The general case of a “curved” space-time (if such exists) is of course more complicated, but can be dealt with as well.

What then are the true spatio-temporal dimensions of C? How far, starting from the verified “here and now,” does the corporeal world extend into the postulated billions of years and light years?

Now, the first and most basic point that needs to be made in that regard is that physical science as such is unable *in principle* to answer this question. And the reason for this incapacity is simple: physical science, by its very nature, is restricted in its purview to the physical domain. What it “sees” through its man-made lenses are physical entities and nothing else; and that is moreover the reason why, on a fundamental level, the act of measurement—which necessarily involves a transition from the physical to the corporeal—presents itself to the physicist as an enigma, an anomaly bordering upon paradox. Physics is unable to ascertain the dimensions of C for exactly the same reason why it cannot resolve the enigma of state

vector collapse: the fact, namely, that *physics has eyes only for the physical*.

What, then, can one do? If physical science is unable to enlighten us regarding the spatial and temporal extent of the corporeal world, by what means can this knowledge be gained? By what means, in particular, can we ascertain the *age* of that world? It was St. Thomas Aquinas, let us recall, who raised the question whether reason alone could demonstrate that the world had a temporal beginning, and found that in fact it could not, and that it is only by means of Revelation that the issue can be resolved. So too, one may ask, when it comes to the *age* of the corporeal world, could it not be Revelation, once again, that holds the key? One knows that Scripture, taken at its word, does in fact answer the question. It informs us that the world is *young*, which is to say that its age is measured—not in millions or billions—but in *thousands* of years. The exact number, of course, is hardly at issue, and may indeed be in doubt; there are in fact discrepancies in that regard between the Septuagint and Massoretic texts. But the order of magnitude—which is all that presently concerns us—is certainly *not* in doubt. And so, on this basis, one arrives at the conclusion that the region of physical space-time corresponding to the *corporeal* world constitutes indeed a mere speck within the big-bang cosmos, with its billions of years and light years. Except for that "speck," the universe of contemporary cosmology appears on scriptural grounds to be in fact extrapolated. We shall presently reflect upon the ontological status of the extrapolated cosmos; but first it behooves us to take a closer look at the Patristic doctrine. We need to understand in greater depth what Christianity teaches regarding the nature and history of God's creation.

Before all else it should be pointed out that "free" interpretations of biblical texts are bereft of authority: they amount to little more than private opinions. It is needful to interpret Scripture in light of tradition, or as the Orthodox say, "with the mind of the Fathers," which is indeed, in a mystical sense, "the mind of Christ." Revelation, therefore, resides not simply between the covers of a book, but

within the living ambience of the Church, which is truly the Mystical Body of Christ.

My second point is this: Tradition, admittedly, condones multiple interpretations of biblical texts; however, it is a universal principle of traditional exegesis that the literal or direct sense must be respected. And nowhere, let us add, is this principle more crucial than when it comes to the early chapters of Genesis, where the temptation to discard the literal sense becomes nowadays acute. To quote what St. Thomas Aquinas states explicitly in *Summa Theologiae* I.68.1 with reference to the interpretation of Genesis: In discussing questions of this kind, two rules are to be observed, as St. Augustine teaches (*Gen. ad lit*., 1.18). The first is to hold to the truth of Scripture (*veritas Scripturae*) without wavering. The second is that since Holy Scripture can be explained in a multiplicity of senses, one should adhere to a particular explanation only in such measure as to be ready to abandon it, if it be proved with certainty to be false. . . .

As Etienne Gilson explains: “St. Thomas is here in full agreement with St. Augustine, and expressly claims to have taken from him this double principle,” beginning with the precept “to maintain steadfastly the literal truth of Scripture.”4 It appears that even in its Scholastic mode, Christianity gives preference to the literal or non-metaphoric sense: that is indeed the *veritas Scripturae* which is to be embraced “without wavering.” On the other hand, it can also be said that Latin Christianity has at times exhibited a predilection for metaphorical interpretations of biblical texts—not as contradicting the literal sense, but as being “even more true” if one may put it thus. To cite a major example, the interpretation of the Six Days: the Eastern Fathers—from the Cappadocians to St. Chrysostom, St. Symeon the New Theologian, St. Gregory the Sinaite, right up to St. Seraphim of Sarov and St. John of Kronstadt, who reposed in our century—have consistently emphasized the direct interpretation of these “days” as successive periods of short duration, paradigmatic at least of *our* days, in which the stipulated acts of creation took place.

Many of the Latin Fathers, on the other hand, beginning with St. Augustine, have opted for a more metaphysical view of creation, according to which the creative act is one and instantaneous, while the Six Days refer to successive phases in the temporal manifestation of created beings. One could say that, viewed *sub specie aeternitatis*, the six creative deeds of the *hexaemeron* coincide in the *omnia simul* of a single indivisible Act. Whether there be six acts or one depends thus on the point of view: whether one assumes a cosmic or a metaphysical perspective. And I would add that when it comes to cosmology, properly so called, it is the former that takes precedence. So too it is worth noting that St. Ambrose, the teacher of St. Augustine, in a treatise entitled *Hexaemeron,* stands solidly with the Eastern tradition not only in the way he views the Six Days, but indeed on all major points relating to the interpretation of Genesis.

It behooves us now to consider this Patristic and biblical doctrine of creation and early history. I shall follow the lead of Hieromonk Seraphim Rose, whose pioneering monograph on this subject has proved invaluable.5

4. *The Christian Philosophy of St. Thomas Aquinas* (Notre Dame, IN: University of Notre Dame Press, 1994), p.467.

5. *Genesis, Creation and Early Man* (Platina, CA: St. Herman of Alaska Brotherhood, 2000). I am profoundly indebted to Fr. Seraphim for opening my eyes to the breaks into major segments which need to be clearly discerned and carefully distinguished. The first of these periods, to be sure, is given by the Six Days: the days in which the world itself began. This period is not yet history, properly so called, but rather the beginning of history; and as Fr. Seraphim points out: “What *is* the beginning of all things but a *miracle*!”6 By means of suitable hypotheses, contemporary science has succeeded to its own satisfaction in concentrating that miracle at a single point, known as the big bang. Yet Genesis informs us that the miracle was spread out, as it were, over Six Days. It is true that “*He who liveth in eternity created all things at once*”7; yet even so,

viewed from the side of the cosmos that single Act breaks into six successive Acts which together make up the *hexaemeron*, the “work of creation.” The Six Days, therefore, in which the world began, are profoundly different from all succeed-ing days, and together constitute a unique and incomparable period of prehistory.

6. GCM, p.197.

7. Ecclus. 18:1.

It is crucial to reiterate, first of all, that according to the Fathers the Six Days are indeed *days*. The notion that these “days” stand in reality for vast periods of time—a position currently known as the day-age theory, progressive creationism, or old-earth creationism—is altogether foreign to the Patristic mind. It needs however to be pointed out from the start that despite their adherence to the direct or literal meaning of Scripture, the Fathers are by no means “fundamentalists” in the contemporary sense. So far from being simple-minded or naïve, I would argue that their doctrine is in fact more subtle—more refined, one could say—than any of the positions commonly espoused in our day. One must bear in mind that many of these Fathers were mystics of a high order, who may indeed have had access to realms that antedate the Fall. For it goes without saying that there must indeed be a categorical divide separating the primeval and the contemporary universe, which ordinary mortals are unable to cross. The herbs and trees, for instance, said to have flourished in Paradise, are by no means the same as the plants existing in our day; and yet they are truly plants, the forerunners of the herbs and trees we know. What Genesis teaches is that the Fall of Adam has radically changed the world itself: *our* world, that is to say. The catastrophe of man’s alienation from the Source of his being has affected the cosmos at large. An ontological diminution has taken place on a cosmic scale which we, with our likewise diminished faculties, are simply unable to grasp. The Patristic reading of Genesis, literal though it be, is therefore mystical as well: it *must* be, on pain of missing the mark! Only when that “supernatural” conception of the Edenic world is replaced by a

profane understanding does the literal interpretation turn fundamentalist; and only then, let us note, does it become vulnerable in principle to attack on scientific grounds.

The history of the world, according to the Patristic teaching, true significance of the Patristic cosmology, and for providing ready access to the relevant source material. For the convenience of the reader I will include page references to Fr. Seraphim's treatise (using the abbreviation GCM).

Following upon the Six Days there ensued what could be termed the Age of Paradise, a period which came to an end with the Fall of Adam. And as we have noted before, the Fathers insist that the Genesis account of that period be understood in a literal and mystical sense at once; for it happens that with the Six Days we have still not arrived at *our* world: the observable universe in which we presently find ourselves. To be precise, the Patristic understanding of Paradise is mystical in two respects: first, because it insists that the nature of Paradise exceeds categorically what the "carnal man"— St. Paul's *psychikos anthropos*— is able to comprehend; and secondly, because it claims that the things of Paradise can in fact be "seen" in certain states of contemplation. St. Gregory the Sinaite, for instance, speaks of this explicitly when he explains "the eight primary visions" accompanying the state of perfect prayer, where things previously hidden "are clearly beheld and known by those who have attained by grace complete purity of mind."8 And I would add that there *are* in fact no other means by which the things of Paradise can be known: the purified mind constitutes the only "telescope," the one and only "scientific instrument" by which these things can be brought within range of human observation.

8. Quoted in GCM, p.416.

We learn from Genesis, and from the Fathers, that in the Age of Paradise the state of the world and the conditions of life on Earth were vastly different from what we know today. For example, "*the wild beasts of the earth*," and "*all flying creatures in heaven*," and

"*every reptile creeping on the earth which has in itself the breath of life*"9 were as yet what we would term "herbivorous." And as to the nature of Adam, the Fathers accept without question that "*God created man incorruptible*."10 As St. John Chrysostom observes: "*Man lived on earth like an Angel; he was in the body, but had no bodily needs*."11 It appears that by contemporary standards the Age of Paradise is still miraculous. Only after the Fall, and in consequence thereof, do the contours of *our* world begin to come into view; for indeed, "*By man came death.* "12 Think of it: where are those Darwinist "chains of descent" entailing death upon death over millions of years! This is a point of capital importance: whosoever does not accept the dogmatic claim "*By man came death*" has *ipso facto* rejected the Christian worldview. From that point onwards nothing fits anymore: the entire Christian doctrine becomes unraveled.

Once that pivotal contention—"*By man came death*"—has been categorized as an absurdity, the Incarnation, the Redemption, and the Resurrection follow suit. On this point Teilhard de Chardin was not mistaken in the least: given that the evolutionist account of origins is true, it is needful that the doctrine of Christianity be radically revised: "moved to a new foundation" as he said. One has only two options: to stand with Scripture and the Fathers of the Church, or cast one's lot with the Jesuit paleontologist and his successors; a middle ground does not exist.13

9. Genesis 1:30.

10. Wisdom 2:23.

11. GCM, p. 444.

12. 1 Cor. 15:21.

13. On this subject I refer to my monograph, *Theistic Evolution: The Teilhardian Heresy* (Tacoma, WA: Angelico Press/Sophia Perennis, 2012).

Let us continue. *Our* world—the universe as we know it or normally conceive of it—came into being *after* the Fall. A cataclysmic transformation of unimaginable proportions has radically altered not only the external world, but man himself, beginning with his cognitive faculties. As St. Macarius the Great informs us, the bodily expulsion from Paradise had its counterpart in the soul: "That Paradise was closed," he writes, "and that a Cherubim was commanded to prevent men from entering it by a flaming sword: of this we believe that in visible fashion it was just as it is written, and at the same time we find that this occurs mystically in every soul."14 It was at this juncture that the *psychikos anthropos*, the carnal man "*who receiveth not the things of the Spirit of God: for they are foolishness unto him*," and knows them not "*because they are spiritually discerned*"15—that man *as we know him*!—came to be. Not instantly, in fact, but gradually; for as we also learn from Genesis, Adam and Eve remained for some time "close" to Paradise: close enough to see it from afar. It can be said, moreover, that since the original Fall mankind has been engaged in an ongoing fall from Paradise: every betrayal, large or small—everything that theology knows as "sin"—constitutes a link, as it were, in this (decidedly non-Darwinist!) "chain of descent."16

There is reason to believe that even the so-called laws of nature as we know them came into force with the Fall; St. Symeon the New Theologian, for example, suggests this quite clearly when he writes:

"The words and decrees of God become the laws of nature. Therefore also the decree of God, uttered by Him as a result of the disobedience of the first Adam—that is, the decree to him of death and corruption—became the law of nature, eternal and unalterable."17

14. GCM, p.405.

15. 1 Cor. 2:14.

16. I have dealt with this question at some length in *Cosmos and Transcendence* (Tacoma, WA: Angelico Press/Sophia Perennis,

2008), chapter 7.

17. *The First-Created Man* (Platina, CA: St. Herman of Alaska Brotherhood, 1994), pp.82–83.

We need however to understand these last two adjectives in a relative sense; for surely St. Symeon understood well enough that these “eternal and unalterable” laws will again be suspended on “the last Day,” when “*the powers of the heavens will be shaken*”18 and there will be “*new heavens and a new earth; and the former shall be remembered no more*. . . .”19 It appears that what we know as the laws of nature—what the physicist has his eye upon—applies to an interim phase of the cosmos: the period, namely, between the Fall and what theology knows as the general Resurrection.

18. Matt. 24:29.

19. Isa. 65:16.

The consequences of this Christian claim are of course incalculable. Inasmuch as the Earth and the heavenly bodies, together with the primary forms of life, including man, came into existence *before* the Fall, the evolutionist scenario—from the big bang to the formation of galaxies, stars and planets, and thence to increasingly complex molecules, culminating in biological species—this entire scenario, I say, has been cut off at one stroke. To the extent that we have understood “the mind of the Fathers” we realize that the Six Days and the Adamic world before the Fall transcend categorically what “science”—and indeed the *psychikos anthropos* as such — can ascertain. One does not need to examine in detail the backward extrapolations by which scientists have sought to reconstruct the distant past—right up to the stipulated big bang, and of late, even beyond!—because one knows by way of Scripture and tradition that past a certain point, and well before one exits the integral domain of human history, these extrapolations are bound to be fictitious. One therefore knows from the start that assumptions of a non-verifiable nature must have been smuggled into these extrapolations, and that

the observable facts and tested laws of nature do not suffice to yield the evolutionist scenario. We shall return to this question presently.

But first it is needful to observe that Genesis speaks of yet another major turning point in the history of the world, by which the Earth as we know it came to be. I am referring of course to the Flood, which the Genesis account describes in striking detail. We are told, for example, that the waters rose to a height of fifteen cubits—about twenty-two and a half feet!—above the highest mountain peak:

what are we to make of these biblical claims? Theologians, to be sure, have tended for about a century and a half to shy away from a

literal interpretation of the relevant texts, in fear no doubt of ridicule from the scientific sector. The Fathers, on the other hand, taking Genesis at its word, have perceived the Flood as a catastrophe which has drastically altered the face of the Earth as well as the conditions of terrestrial life. With Noah and his descendants a new phase of history—of human *and* terrestrial history—commences: even the climatic conditions appear to have radically changed.

Before the Flood, one is led to conclude, the distribution of water on Earth was significantly different from what it is today. Apparently a great quantity of moisture had been diffused throughout the atmosphere, causing what is nowadays called a greenhouse effect. It was presumably in part these “waters above” that came down at the time of the Flood to cause a global inundation. It has been suggested that prior to the Flood direct sunlight could not penetrate to the surface of the Earth, which might account for the fact that the rainbow—the sign of the primordial covenant—appeared for the first time *after* the Flood. One may speculate that during the Flood, and also presumably in its wake, gigantic upheavals in the tectonic structure of the Earth have taken place, by which the present topography came to exist. We must not forget that the Genesis Flood — assuming of course that it occurred—falls perforce within the province of science in the contemporary sense. Unlike the seemingly miraculous events preceding the Fall, it is something that happened

some five thousand years ago. Is this a claim, then, which can be reasonably maintained today?

It is to be noted from the start that this is not a matter of merely academic or marginal interest; for in fact the contention is indispensable to the Patristic *Weltanschauung,* which stands or falls as the integral doctrine it is. Here too it can be said: deny a part, and you have denied the whole. I propose now to consider the status of the Patristic doctrine in light of known scientific facts.

Until the early decades of the nineteenth century it was widely believed that the Earth is some seven or eight thousand years old, and that the major fossiliferous strata were indeed deposited at the time of the Flood. By 1900 the accepted age of the Earth had grown to about 100 million years, and today it is five billion, give or take.

And to be sure, it is now the generally accepted view that fossiliferous strata were formed over vast periods of geologic history by a more or less uniform process of sedimentation. The shift began in 1830 when Charles Lyell announced the principles of uniformitarian geology, based upon the assumption of an “old Earth.” Nine years later John Pye Smith took the next step: declaring the Genesis Flood to have been a local inundation in the region of Mesopotamia, he eliminated in effect the only viable alternative to Lyell’s theory.

The stage was now set for Charles Darwin, whose *magnum opus* appeared in 1859.

How, let us ask first of all, does one substantiate the old-Earth hypothesis? The principal means of estimating geologic age is by radiometric dating of igneous and metamorphic rocks. The idea is simple. Given that a sample contains traces of a radioactive isotope plus some element belonging to its decay series (commonly referred to as parent and daughter elements, respectively), one can calculate the length of time needed to produce the observed ratio of the two—*provided* one knows the initial ratio, and knows also that no contamination or leaching has taken place during the process of

decay. And of course there is a third generic assumption: namely, that the rate of radioactive decay some millions or billions of years ago was the same as it is today. It happens, however, that each of these assumptions is open to serious doubt, especially the first, which seems to be drawn out of thin air precisely to permit radiometric dating. One assumes that initially only the parent element was present; but why should this be the case? One knows, moreover, that usually one or more of these generic assumptions are in fact invalid, for the simple reason that different methods of radiometric dating applied to one and the same sample generally yield significantly different results. In addition, it has been found that radiometric dating, applied to lava samples of known age, can overestimate by incredible factors.

To complicate matters further, it happens that the sedimentary rock which makes up the fossiliferous strata cannot be dated radiometrically at all. It may surprise the non-specialist to learn that these strata are normally dated by means of so-called index fossils, and thus on Darwinist premises! As Edmund M. Spieker—a respected geologist and strict uniformitarian, no less—observes with reference to the time-scale associated with that famous “geologic column” displayed in every natural history museum:

And what essentially is this actual time-scale, on what criteria does it rest? When all is winnowed out, and the grain reclaimed from the chaff, it is certain that the grain in the product is mainly the paleontologic record and highly likely that the physical evidence is the chaff.20

It appears, moreover, that the hypothetical column was “frozen in essentially its present form by 1840,” at a time when geologists had examined only bits of Europe and the eastern fringe of North America. “The followers of the founding fathers,” writes Spieker, “went forth across the earth and in Procrustean fashion made it fit the sections they found, even in places where the actual evidence literally proclaimed denial. So flexible and accommodating are the ‘facts’ of geology.” Even so-called disconformities—old strata piled

upon young—do not seem to disturb these self-assured geologists: as in the case of Darwinism, so in geochronology it appears that problems can be invariably fixed by adding yet another *ad hoc* hypothesis.

The most embarrassing fact, perhaps, is that the stipulated uniformitarian process of fossil formation seems not to be operating anywhere. As Richard Milton points out:

Today there are no known *fossiliferous* rocks forming anywhere in the world. There is no shortage of organic remains, no lack of quiet sedimentary marine environments. Indeed there are the bones and shells of millions of creatures available on land and sea.

But nowhere are these becoming slowly buried in sediments and lithified. They are simply being eroded by wind, tide, weather and predators.21

20. Quoted in J.C. Whitcomb and H.N, Morris, *The Genesis Flood* (Phillips-burg, NJ: P&R Publishing, 1998), p.211.

21. *Shattering the Myths of Darwinism* (Rochester, VT: Park Street Press, 1997), p. 78.

What is evidently needed for fossil formation is *rapid* burial; and as Milton goes on to note: “Not even the most dedicated Darwinist could believe that the average rate of sedimentation of the uniformitarian geologic column (0.2 millimeters per year) is capable of providing rapid burial.”

But the worst was yet to come: since 1985 the case for uniformitarian geology has deteriorated dramatically. What happened is that a French geologist by the name of Guy Berthault initiated controlled experiments designed to ascertain the actual mechanism of sedimentation, the results of which seem to disprove the assumptions upon which Lyell’s theory is based. “These experiments,” writes Berthault, “contradict the idea of the slow buildup of one layer followed by another. The time scale is reduced

from hundreds of millions of years to one or more cataclysms producing almost instantaneous laminae."22 Berthault's results, published between 1986 and 1988 by the French Academy of Sciences, have not unreasonably been referred to as the "death knell" of uniformitarian geology.

22. See Milton, ibid., p. 78.

Perhaps these few indications, sparse though they be, will suffice to show that geochronology is not in fact the "hard" science one generally takes it to be, and that, when all is said and done, the old-Earth tenet remains today what it has been from the start: an unproved and indeed unprovable hypothesis. An unbiased observer cannot but agree with Milton (himself by no means a young-Earth advocate) when the latter concludes: "Because radioactive dating methods are scientifically unreliable, it is at present impossible to say with any confidence how old the Earth is."23

23. Ibid., xi.

Meanwhile creationists—long disdained and ostracized by the scientific establishment—are conducting respectable geologic research of their own, based upon *their* assumptions, which to be sure are inspired, not by dreams of evolution, but by biblical tenets.

The hypothesis of a universal Flood as described in Genesis plays of course a central role in these investigations, and appears today to accord far better with the geologic facts than the opposing uniformitarian premise, which can now be safely written off as a discredited surmise. Today one no longer needs to be a biblical believer to place one's bet on Flood catastrophism.

It is important to note that the Genesis cosmology is undeniably geocentric. We are told in the very first verse that the Earth was created "in the beginning," before the Sun, Moon, and stars were made.

So too one learns that the heavenly bodies were created on the fourth Day, *after* the Earth had been rendered habitable and plant life had appeared. And when God did create “the lights in the firmament of heaven,” He made them “to divide the day from the night,” and “for signs and seasons.” We are given to understand that the cosmos is indeed centered upon the Earth. This preeminence, moreover, mirrors evidently the preeminence of man, the theomorphic creature who, as St. Symeon has expressed it, “was placed by the Creator God as an immortal king over the whole of creation.”24

24. *The First-Created Man*, op. cit., p.90.

The centrality of the Earth in biblical cosmology is first of all *iconic*: we are not yet in the domain of measurable quantities and strictly geometric relations. Yet it is also true, of course, that the prevailing cosmography was in fact geocentric till the advent of modern times, after which the centrality of the Earth came to be progressively diminished or obscured, an historical fact which may not be without spiritual significance. As the matter stands today, the Earth has forfeited every trace of its erstwhile preeminence: neither in our solar system, nor in our galaxy, much less in the cosmos at large is its position presently conceived to be distinctive in any way.

We must not forget, however, that geocentrism refers in the first place to the *corporeal* as opposed to the physical world; it has to do thus with the position of the Earth within the previously defined subset C, precisely. And inasmuch as physical science is in principle unable to ascertain the dimensions or boundary of C, it is *ipso facto* incapable of resolving the question of geocentricity as well. Contrary to the prevailing opinion, therefore, geocentrism has not been ruled out of court.

As to the rival concept of heliocentrism, it is debatable whether the Copernican theory as such contradicts the notion of geocentrality. It is a fact that relative to a heliocentric coordinate system the planetary motions assume a particularly simple and elegant form; as Copernicus himself has put it: “Under this orderly arrangement a wonderful symmetry in the universe” comes to light, “and a definite

relation of harmony in the motion and magnitude of the orbs, of a kind not possible to obtain in any other way."25 But does this prove that it is the Earth and not the Sun that moves, or deny the postulate of geocentrality? Copernicus himself makes neither of these claims, and indeed, from a mathematical point of view the question does not even make sense: which body moves, or which is central, depends upon our choice of coordinates. My point is this: whether we perceive geocentrism to be compromised by the Copernican discovery depends ultimately, not on scientific fact, but on our philosophic orientation. The discovery itself does no more than reveal a hitherto unrecognized "relation of harmony in the motion and magnitude of the orbs" —*ad majorem Dei gloriam!* a Christian can say. And as a matter of fact, Pope Clement VII was delighted to learn of the Copernican discovery, and urged the Polish savant to publish his findings.

25. *De Revolutionibus* 1:10.

The conflict over heliocentrism did not erupt until the following century, when Galileo promulgated not simply a mathematical theory, but an entire worldview. As I have pointed out repeatedly, what underlies the scientistic *Weltanschauung* in its entirety is the so-called bifurcation postulate, and this is precisely what Galileo introduced by his distinction between the so-called primary and secondary qualities. One should add that he did so on spurious grounds, for it happens that there is no scientific basis for that postulate, nor *can* there be. One sees in retrospect that the famous dispute—which has been thoroughly misrepresented in our schools and universities!—was not simply about astronomical facts, as one likes nowadays to believe, but that, underneath the surface, a much larger question was at stake, an issue which in truth vitally affects the Church as the guardian of authentic Christian doctrine. And let me say, in passing, that on the whole the position of the ecclesiastic authorities, and most especially that of Cardinal Bellarmine, was objective, accurate, and fair in its judgment.26

26. For an in-depth discussion of the geocentrism versus heliocentrism issue, I refer to Chapter 8.

As concerns contemporary cosmologies, the crucial point to be noted is that these are based not simply on empirical facts and known physical laws, as one generally imagines, but require in addition a third ingredient of a very different kind: a cosmological model, namely. But whence are these models derived? How, in particular, does one arrive at the model which underlies the most famous cosmology of our day, the so-called big bang cosmology?

Here is what Stephen Hawking and George Ellis have to say on this question:

We are not able to make cosmological models without some admixture of ideology. In the earliest cosmologies, man placed himself in a commanding position at the centre of the universe.

Since the time of Copernicus we have been steadily demoted to a medium sized planet going around a medium sized star on the outer edge of a fairly average galaxy, which is itself simply one of a local group of galaxies. Indeed we are now so democratic that we would not claim our position in space is specially distinguished in any way. We shall, following Bondi, call this assumption the *Copernican principle*. A reasonable interpretation of this somewhat vague principle is to understand it as implying that, when viewed on a suitable scale, the universe is approximately spatially homogeneous.27

27. *The Large Scale Structure of Space-Time* (Cambridge University Press, 1973), p.134.

It appears that geocentrism was cast out, not on the strength of scientific facts, but indeed on *ideological* grounds. The problem seems to be that geocentrism smacks of intelligent design. It happens that the founders and protagonists of astrophysical cosmology espouse an ideology that favors chance or randomness

in place of an intelligent Creator; fundamentally, big bang cosmology is Darwinism on a cosmic scale.28

28. We shall have occasion to recur to this point in the chapters to follow. See also *Science and Myth*, op. cit., pp. 194–200.

The question arises now whether one can construct a viable relativistic cosmology starting with a *geocentric* model. And a second question is this: In such a geocentric universe, would the Earth be young or old? To be sure, the prospect of a tenable young-Earth cosmology seems rather slim. Astronomers, we are told, have observed galaxies 12 billion light years distant from our planet: according to biblical chronology, this would mean that the photons responsible for these observations embarked upon their cosmic journey some 12 billion years *before* the world began! On the face of it, the scenario seems absurd. One must remember however that time, relativistically speaking, is not the absolute we normally take it to be, but can run at vastly different rates. It is therefore indeed conceivable that 12 billion years of star-time translates into some thousands of years as measured by terrestrial clocks. Given that biblical chronology refers to Earth-time, there would in that case be no contradiction between a *young* creation and *ancient* stars. But the question remains of course whether this conceptual possibility can be realized in an actual relativistic cosmology.

This brings me to the remarkable investigations of Russell Humphreys, a physicist with biblical as opposed to Darwinist persuasions, who did recently propose a relativistic cosmology along these lines.29 Humphreys postulates a bounded spherical space with the Earth at its center. The model is classical: Ptolemaic almost. But it is also profoundly Christian: the very geometry of such a universe is indicative of design, of purpose, even as the opposing model of an unbounded universe with an “approximately spatially homogeneous” mass distribution is suggestive of randomness, of blind chance. Boundedness itself, moreover, is suggestive of *transcendence*, a notion closely allied to that of intelligent design, and equally unpalatable to the scientific mainstream. Humphreys

nevertheless concurs with the big-bang cosmologists regarding cosmic expansion: this tenet, he believes, is based, not on the so-called Copernican principle, but indeed on empirical grounds. His task, then, is to construct an expanding spherical cosmos satisfying the equations of general relativity, a problem, it turns out, that relates intimately to the theory of black holes. A black hole, it will be recalled, is a region of space in which the gravitational field is so strong as to cause both matter and radiation inside the region to be permanently trapped: not even light can escape, hence the term "black hole." Such a region is bounded by an intangible surface called the event horizon, at which light rays emanating from inside the black hole are turned back. The event horizon, moreover, proves to be semi-permeable, which is to say that matter and radiation can pass through that surface in one direction: in this instance, from outside in. One may recall that Stephen Hawking has provided an impressive description of an astronaut traveling toward the event horizon of a black hole;30 what is striking is the extreme gravitational time dilation 31 experienced as the event horizon is approached: the astronaut's clock slows down (relative to *our* clocks) and comes to a stop as the event horizon is crossed.

29. *Starlight and Time* (Green Forest, AR: Master Books, 1994).

Now, it happens that the equations of general relativity allow also a second scenario, which can be briefly characterized as a black hole operating in reverse. One has once again a region of space bounded by a semi-permeable event horizon; but this time matter and radiation can only pass *out* of the region. These strange solutions were discovered mathematically in the seventies and dubbed "white holes," but up till now have proved to be of little interest to astronomers and cosmologists. It turns out, however, that a white hole is precisely what one needs to arrive at a cosmological model that is spatially bounded. Humphreys shows in fact that a spatially *bounded* universe *must have* expanded out of a white hole. In the history of a geocentric universe there must consequently be a moment when the event horizon passes through the surface of the Earth; what does this mean? In place of an astronaut approaching

the event horizon from the outside, imagine an observer on Earth emerging from inside the white hole. Now it is Earth-time that almost stands still, while the clocks on distant stars seem by comparison to be racing at a fantastic rate: fast enough, in fact, to measure out a billion years in a period of arbitrarily short duration as registered by *our* clocks. Remarkably, it appears that *a geocentric cosmology is perforce a young-Earth cosmology as well.*

It is surely of great interest that such a young-Earth cosmology has been shown to exist, and creationists are justifiably hopeful that it will accord with the observable facts better than the big-bang theory, which actually leaves much to be desired in that regard. We must not forget, however, that physical cosmologies, no matter how well they may fit the empirical data, are subject to a generic limitation arising from the ontological discrepancy between the physical and the corporeal domains; and this is what needs now to be clarified.

First of all I contend, once again, that the corporeal has ontological primacy over the physical. What does this mean? Obviously physical entities exist as intentional objects; but so do the entities perceived in a dream or a mirage. I am by no means suggesting that physical entities are no more than figments of our imagination! My point, rather, is that they are *derived* in relation to the corporeal: *primary* existence, I maintain, stems directly from the creative Act of God, and thus from what St. Thomas Aquinas terms *esse*, the act-of-being itself. As we read in the prologue of St. John's Gospel: "*All things were made by Him, and without Him was not anything made that was made*." Now, "*what was made*" on the ontologic level of our world are *corporeal* entities: all the rest—from a mirage to the particles and fields of physics—hinge upon the corporeal realm, from which they derive such being or reality as they have. A reality they do of course have; but it is a *derived* reality, from which, moreover, the corporeal can *not* in turn be derived.

This position is of course the exact opposite of the reductionist view, which in effect assigns ontological primacy to the physical.

The corporeal comes thus to be conceived as an epiphenomenon of the physical, notwithstanding the fact that this presumed epiphenomenon proves to be scientifically incomprehensible: for indeed, if it were not, it would *ipso facto* reduce to the physical. It is moreover worth noting that the claim of physical primacy is itself opposed to the canons of scientific empiricism, and thus to the dominant trend in the philosophy of science, which is *epistemological* in its fundamental principles: an empiricism, namely, which insists upon the primacy of scientific observation, of controlled sense experience one can say. The claim of physical primacy stands thus actually in contradiction to the philosophic foundations upon which physics itself is based. It was Niels Bohr—and not his realist opponents!—who accords with these founding principles when he declares: "There *is no* quantum world; there is only a quantum description."

30. *A Brief History of Time* (London: Bantam Books, 1988), pp.87–88.

31. The so-called special theory of relativity predicts a "velocity time dilation": the rate at which clocks in motion "tick" relative to a reference frame conceived as stationary diminishes with their velocity and tends to zero as one approaches the speed of light. The general theory of relativity, which takes account of gravitational fields, predicts in addition a second kind of time dilation, which is to say that gravitational fields likewise slow the rate of clocks.

I would also note, in passing, that one can hardly affirm physical primacy without reifying the physical by endowing it with corporeal attributes. A fundamental particle, thus, comes to be endowed with a shape and position befitting a marble or billiard ball, contrary to what quantum theory permits us to conceive. In a word, in attributing primacy to these putative particles we spuriously corporealize them —a fact which in its own way affirms again the primacy of the corporeal. As Heisenberg has noted, fundamental particles are not, strictly speaking, "things," but constitute "a strange kind of physical entity midway between possibility and reality."32 To think of these so-

called particles as “things,” and indeed as the primary things no less —that surely is naïve, to say the least.

Granting the primacy of the corporeal—granting, in other words, that such reality as the so-called fundamental particles may have derives from the corporeal domain—we need to take note of another fundamental fact, which happens to be so simple and obvious as to be easily missed. I contend next that every derived reality is determined by the nature of the primary entities from which it is derived. We may put it this way: secondary realities are determined by a law affecting the primary. A mirage, for example, stems from a 32. *Physics and Philosophy* (New York: Harper & Row, 1962), p.41.

law of optics, and the holes in cheese from a law that determines the nature of that substance. So too, I say, does the physical derive from a law which defines the nature of the corporeal. That law, to be sure, is not a physical law; it is the principle, rather, which determines both physical things together with the law or laws that apply to them. Now, it goes without saying that God is the author of corporeal nature and its law; we must not forget, however, that one needs to distinguish between corporeal nature *before* and *after* the Fall.

And this brings me at last to my main contention: the law, I say, which founds the physical domain came into force precisely at the moment of the Fall. It can in fact be none other than that “law of nature, eternal and unalterable” of which St. Symeon speaks: the law that came into effect when God decreed “death and corruption.”

We must remember—hard as it may be for us to conceive—that prior to this cosmic catastrophe there *was no* death, there *was no* corruption. It appears that the nature of “flesh,” and thus of what we term “matter,” has drastically changed. I would point out that we catch a glimpse of this fact in the Gospel accounts of the Resurrection: for example, by the circumstance that the resurrected body of Christ was able to pass through physical barriers such as walls and doors. The entire domain of the authentically miraculous, for that matter, bears witness to the fact that corporeal natures can in principle be freed from the fetters of physical law: that under

appropriate conditions these laws are suspended. And it is of course highly significant that the miraculous abounds within the ambience of mystics and saints: of men and women, that is, who have approached or regained the pristine state, the state of Adam and Eve before the Fall.

What, then, does the primacy of the corporeal imply concerning physical cosmology? It forces us to conclude that the physical domain does not antecede the Fall, and will cease to exist the instant "new heavens and a new earth" shall come to be. No physical cosmology, therefore, retains validity as one extrapolates beyond either of these two God-given bounds of human and cosmic history.

Extended beyond either divide, physical theory retains a merely formal sense; in other words, it becomes fictitious. To be sure, such a fiction may yet prove to be of use in organizing or predicting certain facts of observation: the very idea of extrapolation implies as much.

One falls into error, however, the moment one regards the extrapolated theory as a factual account of a past or future state. *No physical theory, moreover, remains factual as one extrapolates backward to the formation of the first man.*

This does not mean, however, that a physical theory can convey no information whatsoever past the two given thresholds: the point, rather, is that whatever knowledge it may convey beyond these bounds ceases to be scientific. It will be instructive in that regard to reflect somewhat on white hole cosmology. The physical theory needs evidently to be "calibrated" by identifying the moment at which the shrinking event horizon crosses the surface of the Earth.

Humphreys, biblical creationist that he is, situates this pivotal event at the fourth Day to coincide with the formation of the Sun, Moon, and stars; but in so doing, he extends the physical theory backwards into a zone to which, in light of our foregoing considerations, it does not apply. I propose instead that the moment in question be taken to coincide with the Fall, which is in fact precisely the instant at which *physical* time—time as we know it—begins. That moment, therefore,

has no *physical* prehistory; in the language of Thomistic metaphysics, it marks the passage from aeviternity to time.33

33. Aeviternity, properly so called, may be characterized as the temporality proper to the celestial or angelic order. But whereas Paradise is situated “below” the celestial state and may already be subject to time, it yet partakes of aeviternity; as St. Chrysostom observes: “Man lived on Earth like an angel.” And I would observe that Edenic temporality appears indeed to be a mean between aeviternity and secular time, which is moreover recovered or attained in the liturgical act, and above all in the traditional rite of Mass, in which, as theology teaches, temporal separation is definitively transcended. It is in this sense that the moment of the Fall “marks the passage from aeviternity to time”: at that instant time ceased to be “liturgical,” its link with eternity was broken. And it is by way of this scission that “death and corruption” entered the world.

Now, it happens that Humphreys’ theory bears witness to this metaphysical fact: for at that very moment—given the proposed recalibration—the gravitational time dilation on Earth becomes infinite. For an instant as it were, clocks on Earth stand still: Earth-time (looking backwards) comes to a stop. Physical time itself, moreover, and thus the physical domain as such, springs into being at the very moment when the spherical event horizon drops below the surface of the Earth. The resultant image, thus, of the Earth “bursting through” that surface may indeed be seen as an icon of the Expulsion—despite the fact that it refers to a domain which no longer admits of scientific description.

Meanwhile time in the firmament is racing at incredible speeds relative to the newly inaugurated Earth-time: is there also perhaps a symbolic interpretation—a metaphysical explanation if you will— of this discrepancy in the rate of clocks? It seems to me there is.

Consider the fact that the entire movement is centrifugal: away from the Source and Center, and thus directed towards a Periphery, what Scripture so descriptively terms “*outer darkness*.” Now, if the slowing of clocks to the point of momentary stoppage be indicative of

proximity to the Source, to the Edenic state, does it not stand to reason that the speed of clocks as such is indicative of *distance*—of *ontological* distance to be sure—from that primeval Center? In light of Patristic doctrine this supposition is by no means unreasonable.

On this basis, however, one can readily understand the racing of clocks as one moves towards the Periphery. It thus appears that Russell Humphreys may have given us a relativistic cosmology which turns out to be not only metaphysically meaningful, but theologically sound.

Yet fascinating as white hole cosmology may be, it too remains inconclusive. To be sure, it is already of enormous interest that a geocentric cosmology is relativistically conceivable at all. Most amazing of all, however, is the fact that such a geocentric cosmology is perforce a young-Earth cosmology as well: one senses that this must mean something, that a major recognition stands here at issue. Yet the question remains whether, *qua* physical theory, that wonderful cosmology is well founded. What counts, of course, is the empirical evidence, the so-called facts of observation; and let us note that a single contrary finding suffices in principle to bring down even the most attractive theory. Clearly, it is Nature that has the last word.

Yet however the case may turn out, the fact that a relativistic cosmology such as Humphreys' can indeed be conceived illustrates how drastically astrophysical models depend on assumptions which, so far as science goes, are drawn out of thin air. We need moreover to understand that by way of these freely chosen models ideological preconceptions do come into play, notwithstanding the fact that according to the official textbook wisdom the intrusion of ideology is rigorously excluded by the very methodology of science itself. And when it comes to astrophysical cosmology, in particular, that ideological input proves to be crucial, decisive in fact: whether we opt for the so-called Copernican principle for example—as every mainstream astrophysicist, from Einstein to Hawking, has done—or postulate a geocentric and bounded universe, as does Humphreys,

leads to utterly different results. Let no one imagine, moreover, that "the facts" will eventually determine which of the two theories is correct: we have no assurance that they will. Nor can it be said that, as the matter stands, the "facts" side with the former: as we shall have occasion to see in the next chapter, the matter is by no means as simple as that. And let us not forget that a cosmological model outside the scientific mainstream can hardly be tested at all, given that those who control the technological means to do so are prone to reject such a theory out of hand, that is to say, on *ideological* grounds.

It behooves us now to take note of the fact that the most profound questions contemporary science has begun to address relate precisely to what happened, or will happen, in the "forbidden domains" defined by the two aforesaid cosmic bounds. To transgress these bounds, and thereby extend the sway of the physical to all that exists—such appears to be the objective of present-day science in its most fundamental inquiries. What stands at issue is a radical inversion in our collective outlook, which began with Galileo and the fall of geocentrism, and has been in progress ever since.

But whereas this ostensibly scientific evolution has been operative for many centuries, its ultimate objective has only recently sprung into full view: the publication, in the year 2010, of Stephen Hawking's *The Grand Design*, leaves no doubt in that regard.

The overall picture has now become clear. One sees, first of all, that the postulated astrophysics *extrapolates* in precisely the sense we have assigned to that term. It does so, moreover, not on scientific, but on *ideological* grounds, and thus illegitimately even by scientific standards. But most important of all: the resultant hyper-physics spuriously contradicts the sacred wisdom of mankind, trashes it in fact.

6 The Pitfall of Astrophysical Cosmology

Rumor has it that the so-called big bang is now “a scientifically proven fact.” When Arno Penzias and Robert Wilson discovered the since famous microwave background in 1965, the *New York Times* announced the event with the headline: “SIGNALS IMPLY A BIG BANG UNIVERSE.” Whether they do or do not is of course another question; but the fact remains that big bang theory has since become the official cosmology. From that time onwards every science major has been taught to believe that the universe was born approximately fifteen billion years ago in some kind of an explosion, and has been flying apart ever since. He has been told that this is the reason why stars and galaxies are observed to recede with a velocity proportional to their distance, as the American astronomer Edwin Hubble is said to have shown. Meanwhile the image of an expanding “soap-bubble universe,” dutifully disseminated by the media, has commended itself to the public at large. A radical transformation of our collective *Weltanschauung* has thus been effected.

The reflections to follow break into three disparate parts. I will first review the current scientific status of big bang theory, and thence proceed to comment upon the new cosmology from a theological point of view. I shall contend that despite its seeming affirmation of a *creatio ex nihilo,* big bang cosmology is in fact profoundly hostile to the Christian faith. In the third part we shall consider the claims of contemporary astrophysics as such, without reference to any particular paradigm.

Big bang theoreticians obviously face a formidable task; the theory is after all obliged to account, at least in suitably rough terms, for the physical evolution of the universe, from what Georges Lemaître termed “the primeval atom” to the vastness of its present state. It is hardly surprising, therefore, that one of the most intensive and protracted research endeavors in the history of science has so far succeeded mainly in exacerbating the difficulties. The story begins, if you will, with Lemaître’s “primeval atom” version of big bang theory,1 presented in 1931 at a scientific conference, and soon rejected by the astrophysics community. Lemaître had anchored his theory to

the claim that a big bang was needed to account for the existence of cosmic rays, a conjecture which proved to be mistaken. After a period of inactivity, interest in big bang theory resumed at the end of the Second World War, stimulated conceivably by the spectacle of exploding atom bombs. The second version, in any case, was proposed in 1946 by a charismatic physicist named George Gamov.2 In place of Lemaître's cosmic rays, Gamov anchored his theory to the chemical elements, which he perceived as a tangible vestige of the big bang. I vividly recall a physics colloquium, at which, to my amazement, Gamov described in detail the nuclear constitution of the universe so many microseconds after the big bang. Even so, his theory also failed: when Fred Hoyle and his collaborators published a paper in 1957 which showed that nucleosynthesis in the interior of stars gives rise to heavy nuclei—in proportions comparable to existing values no less—the second brief era of big bang theory came to an end. For a time it appeared that an alternative cosmology, the so-called steady state theory, had taken the lead—until that historic moment, in 1965, captured by the *New York Times* in its banner headline.

1. Georges Lemaître, a student of Arthur Eddington, was a Belgian Jesuit and physicist. His speculations regarding "the primeval atom"—a curious blend of physics and philosophy—seem to have been well received in ecclesiastic circles, judging by the fact that he was soon thereafter appointed director of the Pontifical Academy of Science. The idea of the big bang, oddly enough, goes back to the poet Edgar Allen Poe, who was an avid science amateur. To counter the problem of gravitational collapse, he proposed, in 1849, that the universe came to birth in an explosion.

2. Like Stephen Hawking in *A Brief History of Time*, Gamov commended his vision of the universe to an entire generation in a science best-seller entitled *One, Two, Three, Infinity.*

What is the connection, then, between the microwave background and the big bang? It is clear on the basis of fundamental physics that the big bang event (if indeed it did occur) must have produced an

abundance of radiation, which moreover must still exist in the universe, for the simple reason, fundamentally, that it has nowhere else to go. Since it must, moreover, exist in a state of thermal equilibrium—again, because there is no “outside” with which it could exchange energy—that radiation is necessarily of a kind emitted by a so-called black body, the temperature of which can be deduced from its frequency distribution. And finally, the radiation field produced by the big bang must be spread evenly throughout the universe, the reason being that homogeneous initial conditions produce homogeneous effects. According to Gamov’s original calculations, that radiation field should by now have redshifted to correspond to a black-body temperature of 20˚K, which would place the bulk of it in the microwave range. Gamov’s estimate was later revised to 30˚K by P.J.E. Peebles, and there the matter stood till that day, in 1965, when the microwave background was picked up on a giant “horn antenna” at the Bell Laboratories, and deciphered by two young scientists who had never heard of the big bang. Despite the fact that the radiation turned out to have a blackbody temperature of 2.7˚K (off by a factor of ten), the discovery conveyed the impression that an astounding prediction had now been verified, and that indeed “signals imply a big bang universe.”

The theory, however, was not yet in the clear. The biggest problem facing the new cosmology was to account for the large-scale structures of the astronomic universe. And here the microwave background proved to be in fact a formidable obstacle: its very smoothness and isotropy seemed to preclude the kind of “clumpy” universe we now observe. Given that matter in the primeval cosmos was as evenly distributed as the microwave background leads us to believe, how could it become concentrated into stars and galaxies?

Presumably some initial fluctuations became amplified under the influence of gravitational forces to form the stellar universe; one finds, however, that the gravitational fields needed to accomplish such a consolidation must be vastly stronger than the total amount of matter in the universe allows. To make matters worse, it turns out that relative velocities between nearby stars and galaxies tend to be

far too small to achieve the observed separations within the fifteen or so billion years the big bang scenario allows. Meanwhile the problem has been further exacerbated by a dramatic increase in the dimensions of large-scale stellar objects identified by astronomers.

First there were single stars, then galaxies, and then clusters of galaxies; and finally, in 1986, Brent Tully, an astronomer at the University of Hawaii, discovered that most galaxies within a radius of a billion light-years are concentrated into slender structures measuring about a billion light-years in length. These are the so-called superclusters which have since been documented by several research teams. In 1990, Margaret Geller and John Huchra of the Harvard Smithsonian observatory discovered a huge band of galaxies, of supercluster magnitude, which came to be known as the Great Wall; and soon thereafter another team discovered a series of similar structures “behind” that so-called Great Wall. Moving outwards (away from the Earth), they discovered a sequence of “great walls,” more or less evenly spaced about six hundred million light-years apart. This is not at all what big bang theorists expected, or wanted to find. In fact, it is about the worst-case scenario, a discovery to which the *Washington Post* responded with another banner headline: “BIG BANG GOES BUST” this time.

Meanwhile a formidable research endeavor has been under way to examine the microwave background with maximum precision in the hope of finding anisotropies. One can well understand why cheers rang out when the COBE (Cosmic Background Explorer) satellite disclosed measurable fluctuations: it was the kind of result the beleaguered theoreticians had been eagerly waiting for. Unfortunately however the variations, measuring around one part in a hundred thousand, proved to be far too small: it appears that fluctuations on the order of one percent are needed to account for the formation of stellar objects such as Tully’s superclusters or the Great Wall. The radiation background, it appears, turns out to be too smooth and isotropic to permit a transition from the postulated primeval state to the observed astrophysical universe.

Big bang theorists typically respond to problems of this kind by making additional assumptions. To be sure, a scientific theory need not be instantly discarded when it comes into conflict with facts of observation: it is normal practice to search for an appropriate hypothesis to resolve the impasse, a process which not infrequently leads to further discoveries.3 But this fact hardly exonerates a theory which enjoys little or no empirical support and is kept alive mainly through a proliferation of such *ad hoc* assumptions. One might object to my second contention on the grounds that big bang theory has in fact predicted the microwave background; not only, however, did it predict a false temperature, but it happens that the microwave background can be cogently explained in other ways.4

3. Discrepancies, for instance, between observed planetary orbits and trajectories predicted on the basis of Newtonian physics led astronomers to conjecture that these deviations may be caused by an unidentified object. This hypothesis was verified in 1930 with the discovery of the planet Pluto.

4. It can be explained, for example, by the quasi-steady-state theory of Burbidge, Hoyle, and Narlikar (see *Physics Today*, vol. 52, no. 4, April 1999), or by the plasma-physics approach of Hannes Alfvén (*Cosmic Plasma*, Holland: D. Reidel, 1981), both of which appear to be viable alternatives to big bang cosmology.

Like Lemaître's "prediction" of cosmic rays and Gamov's of chemical elements, the prediction of a microwave background actually does little to shore up the hypothesis of the big bang. Meanwhile the addition of ever new—and ever more fantastic!—hypotheses to square the original conjecture with the facts is not a good sign; there is point to Brent Tully's candid observation: "It's disturbing to see that there is a new theory every time there is a new observation."

What does one do, for example, when it turns out that the amount of matter in the universe is about a hundred times too small to permit the formation of galaxies? Literally with a stroke of the pen one supplies the missing mass—a hundred times the estimated mass in the universe!—by postulating something called "dark matter": a kind

which does not interact with electromagnetic fields and has never yet been observed. A profusion of dark matter candidates has been proposed in recent decades by helpful particle physicists: there are axions, higgsinos, photinos, gravitinos, gluinos, preons, pyrgons, maximons, newtorites, quark nuggets, and nuclearites, to mention a few; the problem is that all these wonderful particles exist so far only on paper. But let us suppose that there do actually exist, say, higgsinos or quark nuggets: would this suffice to extricate big bang theory from its quandary? Certainly not; a number of other major problems would remain. What is more, each new hypothesis tends to introduce problems of its own, which will presumably necessitate the introduction of additional hypotheses.

There is no reason on earth to believe that this procedure will eventually converge; and if it should, one wonders whether one has then *found* a truth, or *constructed* it, as Sir Arthur Eddington, in company with some postmodernist philosophers of science, maintains.5

5. On that question I refer back to Chapter 2.

We have so far considered only one major difficulty: the problem of accounting for the formation of large-scale stellar objects. To round out this brief review, I will touch upon one more predicament. Let us note that when it comes to distant stellar objects, from stars to galaxies and clusters of galaxies, all we have to go on is light emitted by the objects in question and received by telescopes, be they terrestrial or mounted on satellites. By light, of course, we understand electromagnetic radiation of whatever frequency, from radio waves down through the visible range to X-rays and gamma rays. In a word, what we receive are light-particles or photons, each of which defines a position on a photographic plate and carries a frequency: that is all. These are, ultimately, the hard empirical facts; the rest is theory, a matter of interpretation. The radiation received does however carry a wealth of information, some of which proves to be quite unequivocal in its implications. It is known from laboratory experiments that the distribution of frequencies emitted by a

chemical element, for example, is a characteristic of that element. The emission spectrum constitutes thus a signature permitting us to detect the presence of hydrogen, helium, and other elements in stars and galaxies. It happens, however, that spectra received from outer space are generally shifted to the left on the scale of frequencies, a phenomenon known as the redshift; what causes this shift? One has long surmised that stellar redshifts constitute a Doppler effect, which is to say that the reduction of received frequencies is caused by a recessional velocity of the source, just as the pitch of a train whistle is lowered when the train is speeding away from us. On this basis stellar redshifts have been interpreted as evidence for an expanding universe: big bang cosmology is founded upon that hypothesis.

Now, it happens that observational results have accumulated for half a century which seem to contradict that assumption. The first bit of bad news for big bang theorists came in 1963 with the discovery of extragalactic radio sources now known as quasars, whose emission spectrum proved to be heavily redshifted, corresponding to recessional velocities approaching the speed of light. It was soon found, however, that these quasars were typically associated with galaxies whose redshifts are normal, that is to say, relatively small.

Stellar objects, thus, which according to big bang geometry were supposed to be billions of light years apart, appeared to be close neighbors, which is to say that the Doppler interpretation of quasar redshifts has become suspect. Meanwhile intrinsic (non-Doppler) redshifts have been surmised in other stellar objects, down to the level of stars; as one authority in this field informs us: “Most extragalactic objects have intrinsic redshifts.”6 But this would mean that the hypothesis upon which big bang cosmology is based—the assumption that stellar redshift equates to recessional velocity—has been disqualified.

6. Halton Arp, *Seeing Red: Redshifts, Cosmology and Academic Science* (Mont-real: Apeiron, 1988), p. 95. One of the foremost experts on quasars, Halton Arp apparently became *persona non grata* among his peers in the U.S. when he began openly to question

the Doppler interpretation of stellar redshifts. He is now at the Max Plank Institute for Astrophysics at Munich. His book constitutes an invaluable resource in a field in which it is becoming difficult to separate fact from fiction.

Certain developments on the theoretical side, moreover, have augmented these misgivings. In 1977 Jayant Narlikar, an astrophysicist, succeeded in generalizing the equations of relativity so as to allow the masses of fundamental particles to increase with time.

The theory, it turns out, predicts intrinsic redshifts caused by this variation of particle mass. The idea is simple: the smaller the mass of an electron, the smaller will be the energy it loses in a so-called quantum jump, which however is just the amount of energy given off in the emitted photon. Since the frequency of a photon is proportional to its energy, one obtains thus an intrinsic redshift. In place of the redshift-velocity relation underlying big bang cosmology, the Narlikar theory gives us an inverse redshift-age relation, which enables one to interpret existing data in a new key. The Hubble relation, according to which redshift is proportional to distance, can now be understood from the fact that distant stellar objects are observed at an earlier time due to the finite speed of light, and will consequently tend to have smaller particle masses and correspondingly larger redshifts in proportion to their distance. The heavily redshifted quasars, on the other hand, which do not satisfy the Hubble relation, are now perceived as being constituted by recently created particles ejected from an active or so-called Seyfert galaxy.

In this way the new theory does justice to all the relevant facts: to those which support the Hubble relation, as well as those which do not. But now the universe is *not* expanding, nor did it nor did it originate in a singularity: in a word, there *is* no big bang.7

7. Ibid., pp. 225–233.

It is not my objective to tout the Arp-Narlikar approach, which presumably has problems of its own. My purpose, rather, is first of all to bring home the fact that in resting upon the Doppler interpretation of stellar redshifts, big bang cosmology stands on demonstrably shaky ground; and secondly, that there appear to be viable astrophysical alternatives which cannot rightfully be rejected out of hand. Yet the obvious fact remains that big bang cosmology stands nonetheless as the official doctrine. Many astrophysicists are no doubt disturbed by the lack of evidential clarity, to put the case mildly, but few at present seem prepared to challenge the *status quo*.

Admittedly, a handful of leading scientists have openly proclaimed the demise of big bang cosmology,8 and even the conservative science journal *Nature* has run a lead editorial under the caption

8. Foremost among this handful is the late Fred Hoyle, one of the pioneers.

"Down with the Big Bang." But such occasional expressions of dissent have so far had little effect upon the astrophysics establishment at large; too many careers, it seems, hang in the balance.

We propose now to look at the big bang scenario from a theological perspective. Leaving aside the question as to whether this cosmology is factually correct, we shall treat it as a kind of myth or icon, a symbol to be read. What, then, does the big bang signify? What above all strikes one is the idea of a temporal origin: the notion that the universe "did not always exist." This is not to say that "long ago" the world did not exist, for time as we know it refers to cosmic events and cannot therefore antedate the universe itself: "Beyond all doubt," says St. Augustine, "the world was not made *in* time, but *with* time." What big bang theory affirms, rather, is that the universe has a finite age; the question, now, is whether this implies an act of creation *ex nihilo*. I would argue that, from a strictly logical point of view, it does not. But this is actually beside the point: we are now "reading the icon," a task which is not simply a matter of logical analysis. In its iconic import, I say, the big bang picture does

overwhelmingly suggest what Christianity has always taught: namely, that the universe was brought into being some finite time ago through a creative act. As Pope Pius XII declared in 1951, in an address to the Pontifical Academy of Science:

In fact, it seems that present-day science, with one sweeping step back across millions of centuries, has succeeded in bearing witness to that primordial *Fiat lux* uttered at the moment when, along with matter, there burst forth from nothing a sea of light and radiation. . . . Hence, creation took place in time; therefore, there exists a creator; therefore, God exists![9]

9. As we shall presently see, it is likewise significant that Pope John Paul II, in another address to the Pontifical Academy, delivered in 1988, warned against "making uncritical and overhasty use for apologetic purposes of such recent theories as that of the big bang."

It would seem from this animated papal expression of assent that the impact of big bang cosmology upon Christianity is bound to be salutary; but such proves not to be the case. I contend that the new cosmology has in fact exerted a baneful influence upon Christian thought, and has contributed significantly to the deviations and vagaries afflicting contemporary theology; how can this be? The answer is simple: icons can be dangerous, lethal actually, due to the fact that the icon itself can be mistaken for the truth, "the finger for the moon" as the Chinese say. And this is what has actually happened in the case of the big bang: we are dealing, after all, with a scientific paradigm declared by the leading authorities to be factually true. Now, the problem is that in its *factual* as distinguished from its *symbolic* significance, the big bang scenario is flatly opposed to the traditional Christian cosmogony based upon Genesis. Take for instance the biblical fact that the Earth and its flora were created *before* the Sun, Moon and stars: surely this rules out all contemporary theories of stellar evolution, even as it rules out all Darwinist claims. Theologians, as we know, have for the most part responded to this challenge by "demythologizing" the first three chapters of Genesis; but in so doing, I contend once again, they

have taken a wrong turn. Placing their trust in a man-made theory, which moreover stands demonstrably on shaky ground, they have contradicted the inspired teaching of the Fathers and the Church. Let it be said once again that the first three chapters of Genesis, taken in their literal historical sense, cannot be denied without grave injury to the Christian faith. The point has already been made implicitly in the preceding chapter: in bringing to light the content of biblical cosmogony, we have at the same time demonstrated its central importance to Christian doctrine. Whatever contemporary theologians may say in their pursuit of "scientific correctness," the fact remains that the teachings of Christianity presuppose the biblical cosmogony, even as the Redemption presupposes the Fall. It is utterly chimerical, thus, to imagine that the doctrine of Christ actually makes sense in a big bang universe; and one might add that the biblical cosmogony has in fact been mandated by the Pontifical Biblical Commission in 1909. In a definitive response to eight questions relating to "The Historical Character of the Earlier Chapters of Genesis" the Commission explicitly denies the validity of "exegetical systems" which exclude the literal historical sense of the first three chapters.10

10. Denzinger, *The Sources of Catholic Dogma*, 2121–2128.

Getting back to big bang cosmology, I would like to point out that this doctrine is evidently all the more compelling to a Christian public on account of its obvious symbolic signification: what could be more wonderful, after all, than a scientific cosmology bearing witness to the primordial *Fiat lux*! In conjunction with certain other scientific developments, the new cosmology has thus fostered a major movement of reconciliation between the scientific and the religious communities. Book titles such as "God and the New Physics" (by physicist Paul Davis) or "God and the Astronomers" (by the astronomer Robert Jastrow) have come to abound, and it is hardly possible, these days, to keep up with the profusion of seminars and symposia on "science and religion" being held all over the world.

And everywhere one encounters the same message of “peace and harmony” from both of the former contestants. There is however a price to be paid on the part of religion: wherever a conflict does arise —as between Genesis and the big bang—it is always Christianity which is obliged, by the presiding experts, to conform its teachings to the latest scientific theory. It appears that a certain fusion of science and religion is now in progress on a world-wide scale, which threatens to transform Christianity into some kind of “theistic evolutionism” more or less akin to the quasi-theology of Teilhard de Chardin.11

11. I have dealt with this question at length in Theistic Evolution: The Teilhardian Heresy, op. cit.

In a word, the new cosmology is not quite as innocuous as one might think. So far from being compatible with the truth of Christianity, it proves to be one of the most seductive and potentially lethal doctrines ever to threaten the integrity of the Christian faith: a dogma amply capable, it seems, of “deceiving even the elect.” The devil, they say, gives us nine truths, only to catch us in the end with a lie: could big bang cosmology be a case in point? Could *this* be the underlying reason why an atheistic science has now promulgated—to everyone’s amazement!—a doctrine which, on the face of it, glorifies God as the creator of the universe? It has at times been suggested that there is indeed a connection between the scientific Pope Pius X, in his motu proprio “Prestantia Scripturae,” declared the decision of the Biblical Commission, past and future, to be as binding upon the conscience as decrees of the Roman Congregations.